CHALDEAN

GRECIAN

THE FATE OF EMPIRE
DEPENDS UPON THE
EDUCATION
OF YOUTH
ARISTOTLE

MEDIEVAL

COLONIAL

THE SECRET OF EDUCATION LIES IN RESPECTING THE PUPIL

EMERSON

PIONEER

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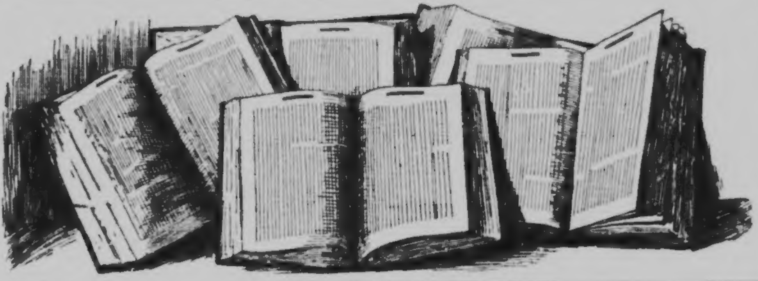
Johann Friedrich Herbart

If teachers possess originality, they will utilize all that comes to hand to provide stimulus and occupation for the objects of their care.

—*Herbart*



PUBLIC SCHOOL METHODS

8895

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Twenty-Five Type Studies on Reading, Geography, Scientific Agriculture and History

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Cinderella
Barefoot Boy

Geography

Lake Michigan
Mount Shasta
Coast of Norway
St. Petersburg
New Orleans
Panama Canal
Canadian Pacific Railway
Steamship Voyage from Montreal to Bristol, England
Rocky Mountains Park

Scientific Agriculture

Corn
Cotton
Coffee
Irrigation in the Northwest

History

Columbus
Iroquois Indians
The Puritans
Union Jack
Struggle between the English and French for North America
Burgoyne's Invasion
War of 1812
Laura Secord
Steamship Traffic on the St. Lawrence
British Colonies

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CHAPTER ONE

ELEMENTARY SCIENCE

INTRODUCTION

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1. Scope of the Work. Elementary science in the grades above the primary should include the study of those problems of life which for their solution depend upon a knowledge of the leading facts of the various branches of physical science. It is within the province of the elementary school to acquaint the pupils with the facts of these various branches of science which pertain directly to their welfare and happiness, also to give them some idea of the principles upon which classification depends and to lead them to recognize the most prominent groups in the vegetable and animal kingdoms. Minute classification should not be attempted, neither should the study of those phenomena whose principles and laws are difficult to discover be introduced.

2. Importance. The applications of science to life in the last half-century have changed our surroundings to such an extent that we practically live in a new world, and to live most advantageously in the present day one must understand these conditions.

The truths of science are universal. The problems that arise in science are the same in kind as those that arise in life. An understanding of the laws of nature and obedience to them are essential to health and happiness; the economic benefits to the country that might be derived from a knowledge of certain facts learned through the study of science would amount to hundreds of millions of dollars annually. From all points of view no more useful or practical subject can be taken up in the elementary schools than the study of the elements of the various branches of natural science, and this study should receive much more attention than is generally given it.

3. Relation to Other Branches. As science touches all phases of life, so the lessons in elementary science are more or less closely related to all other branches in the course of study. Many allusions in the reading lesson are explainable only by an understanding of the elementary principles of some branch of science. The science lessons also furnish excellent topics for oral and written descriptions, and they constitute the foundation of elementary geography.

The relation of science to literature constitutes one of the most fascinating features of the work. Since we cannot read Longfellow, Bryant, Whittier, Holmes and Lowell, among American poets, or Tennyson, Wordsworth or others, among the English poets, without having our thoughts constantly attracted to the beauties and wonders of nature, we ought not, in the study of natural objects, to omit references to the beautiful descriptions found in the works of our great writers or in the works of those of less importance. This correlation can be easily arranged by having a group of pupils in the literature class study some selection which bears directly upon the topic in science that is under discussion. If you are studying clouds, have the literature class study Shelley's poem, *The Cloud*; if you are studying about frost, use the picture of the frozen brook in Lowell's *Vision of Sir Launfal*, in the same way. Many similar illustrations will occur to you.

The old nature study taught nature in order that children might love it when they grew older; the new nature study develops the child's love of nature so that he may study it when he is older. The new nature study creates a sympathetic understanding of facts at the same time that it cultivates an appreciation of effects.

4. Purposes. The chief purposes of the study of elementary science may be stated as follows:

(1) To make the child acquainted with his surroundings. By this we mean all those natural conditions—plants, animals, soil, climate and scenery—which combine to form environment.

(2) To lead the pupils to see beauty in the objects of nature. Many people, even in the country, are blind to the beauty of the wild flowers, the songs of the birds, the ever-varying tints of the sky by day and the glory of the heavens by night. Children should be led to discover the beauty which is in the most common things, such as the plants and insects which they often crush under their feet; in finding this beauty they will also learn something of the harmony that exists in nature.

(3) "To prepare children for real life by enabling them to gain an understanding and mastery of the physical conditions of life and the many varied utilities of nature." This purpose is usually considered to be the practical or economic feature of elementary science, and it is a feature through which lessons on this subject win approval with a large majority of the patrons of the school. Such lessons lead the pupils to distinguish between the useful and the harmful in their surroundings. Some species of insects destroy crops and cause great damage. Certain weeds are harmful, because they spread so rapidly, and occasionally plants and animals are met that are harmful to man. Children should learn to distinguish between these classes of objects, how to propagate those that are useful and how to destroy those that are harmful.

(4) To remove fear and prejudice founded upon false ideas which, because of superstition, have been handed down from one generation to another. The majority of people hold foolish notions about many members of the animal kingdom. One is afraid of mice, and another, of bees. Nearly all persons are terrified at the sight of a snake, and much of the wanton destruction of life is due to this fear and prejudice.

Many people hold equally ridiculous superstitions concerning the moon, the weather, the number thirteen, thunder and lightning, and various other phenomena. If children obtain an understanding of the laws and phenomena of climate, and especially of storms, they seldom entertain such ideas, the possession of which is accompanied with more or less dread and worry.

(5) To lead the pupils to become self-reliant. In no subject can the pupil be thrown more completely upon his own resources than in elementary science. Here he must discover things for himself, test his own knowledge and prove his conclusions. Through this method of study he learns to trust his powers, and he acquires a feeling of certainty which gives him a degree of independence and self-confidence.

(6) To teach pupils respect for labor. This applies particularly to the seventh and eighth years. A study of natural forces and laws and their products reveals to the child the universal law that only by its own activity can a living thing survive. Every living thing, from the lowest plant or animal to man, works, and it is only by its work that it can exist, grow and fill its place in the world. When this truth is impressed upon the mind it leads a dignity to labor which many young people never before realized.

(7) To develop character. This is the crowning purpose of all studies, and the one in elementary science towards which all the other purposes point. In the study of science the child is searching for truth; in the study of natural phenomena he acquires the habit of careful observation, and also the habit of making accurate statements concerning small things, both of which are important steps in leading him to a love for truth. As he discovers the usefulness of plants and animals, a spirit of kindness is developed which leads him to treat kindly and to care for those creatures that are more or less dependent upon him; naturally, as he comprehends the harmony running through nature and the majesty of natural law, he acquires a reverence for the Creator of all things.

5. General Directions. While it is not probable that all of the following directions will apply to each lesson, some of them will apply to all lessons:

(1) Every lesson contains a central thought, around which all others should be grouped. Find this thought in planning for the lesson, and so present the subject as to lead

the pupils to search for it until they succeed in finding it. The fact and truth thus discovered will give rise to one or more problems, the solution of which will tax the reasoning power of the pupils and also hold their interest upon the work. These problems can be brought to the attention of the pupils by directing their observation and then questioning them. Ask the children to watch a squirrel climbing a tree, then tell how it does it. How does the squirrel crack a nut? Did you ever find a squirrel's nest? Where was it? Of what was it made? A similar plan can be pursued with many natural objects.

(2) The central truth of the lesson usually has numerous applications. Either by questions or direction the pupil should be led to find them.

(3) In the study of a unit, first direct the efforts of the pupils toward determining the facts. All other questions are subsidiary to this, and depend upon it.

(4) Before beginning work in elementary science, learn what the pupils know upon the subjects to which the lessons pertain, unless you are already familiar with their previous work. A good exercise for determining this fact is to ask the class to write from memory the names of the wild plants which they know, the names of the insects and the names of the animals, both wild and tame, with which they are familiar. An excellent exercise for determining the ability of pupils to observe closely is to give each member of the class a small box of seeds of different varieties to sort, such as a dozen grains each of wheat, barley, oats, buckwheat or other seeds that are easily obtained and which somewhat closely resemble each other. If you have never tried this exercise, doubtless you will be surprised at the numerous failures in separating the seeds into the groups in which they belong.

(5) See that the pupils apply what they have learned.

(6) Keep yourself in the background. In no other line of work is there such an opportunity for the teacher to become an adept in the rare art of keeping herself in the background, and probably in no other line of work is this so essential to

success. The teacher who would secure the greatest results from her science lessons must lead her pupils by suggestion, while they apparently take the initiative. This does not mean that the pupils should take the lead in planning and directing the work. At all times the teacher must be the controlling force, but her power should be so skilfully exercised that it is seldom openly manifest.

6. Material. Elaborate apparatus is neither necessary nor desirable. Nearly everything needed can be made by the pupils and the teacher, or it can be purchased at nominal expense. An opera glass with large lenses is a great help in studying birds, and if each pupil can have a small magnifying glass for the study of insects, small flowers and minerals, the class will be able to do some work that otherwise it might not be advisable to attempt. Conveniences for collecting and storing specimens should be provided. Jars, bottles and boxes can usually be obtained without difficulty or expense, and many articles can be made as they are needed. There should be enough mounted needles to go around the class.

Colored charts of birds and animals are helpful, and a reasonable expenditure for them by the school officials is wise. However, they should not be purchased at the expense of the school library or other equipment which is more generally useful. Pupils should provide themselves with notebooks in which to keep a record of their observations. It is a convenience in handling if these are all of the same size.

STUDY OF CORN

7. Introductory. This plan is designed for a comprehensive study of the corn plant. Those parts of the plan which require close analysis and the observation of minute details, such as pollination and the rate of growth per day, should not be used with the younger classes.

The corn plant is one of the best for study because it is so large that all its parts can readily be seen, because the children can plant the seed and watch the growth through all stages from germination to maturity, and, finally, because from an economic viewpoint corn is one of the most valuable agricultural products.

From necessity, the lessons will be given at intervals, probably about once a week. At each lesson definite things should be decided upon for study before the next lesson, at which all observations should be reported. The last lessons of the spring or summer term should leave the pupils well prepared to carry on observations by themselves during the long vacation.

8. Planting.[1] (a) PREPARATION OF SOIL. Before planting in the field or garden, give a series of lessons on the conditions necessary for the successful growth of the crop. First, discuss the kind of soil best suited for corn. In the locality in which you are is corn more generally planted in the valleys, along streams or on the higher land? What do you know about the amount of moisture it requires?

After the discussion of the soil best suited to the crop, take up the matter of preparing the seed bed. What sort of preparation does the soil need? The answer of this question leads the pupils to see the necessity of using fertilizers, to determine whether deep or shallow plowing is the better, and what should be done to the soil after plowing, before the crop is planted.

(b) TIME. What is the proper time for planting corn? Why is corn usually planted later in the season than oats, wheat or potatoes?

(c) SELECTION OF SEED. If your school is located in a region where corn is generally grown, have each pupil bring

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[1] If the pupils have not studied the germination of corn, plant in window boxes enough to supply the class and study at frequent intervals until the plants reach the surface

If the pupils have never studied germination, plant in other boxes or the school garden, beans, peas, squash or cucumber seed and onion seed. Fill several glass fruit jars with water, place some cotton batting on the water and upon it place a few seeds of each kind. Place others between sheets of moist blotting paper and cover with a plate. Watch the progress of these three groups of seeds from day to day and observe the different plans of germination to the class an ear of the best corn which he can procure. If all ears are satisfactory, let each pupil select his seed from the ear which he has brought, or if the pupils prefer, let them exchange ears and then select seed. Discuss this selection carefully, leading the pupils to see why the kernels should not be taken from the tip or the butt of the ear.

(d) IMPLEMENTS. In planting the corn in the school garden or the home garden, what tools are used? If the farmer has a large field, what machine does he use? Why? These questions will lead to the discussions of various tools, doubtless ending with an explanation of the working of a corn planter. Pupils living in a corn-growing region are familiar with these implements, and with them much of an explanation will not be necessary.

(e) PLANTING THE CORN. When all preparations are made, ask the pupils to plant their corn. How deep should the seed be covered? Why? How far apart should the hills be? Why? If you have a school garden, the study should center around the corn planted there, and as much space should be devoted to the crop as will be necessary to enable the class to have all the corn they will need for study. Probably from ten to twenty hills will be ample. This, of course, can be determined by the number of pupils in the class. In addition to the corn in the school garden, each member of the class should plant a small patch in the home garden, at least from six to ten hills. The older boys should be encouraged to plant as large a patch as they can care for. Each pupil should be asked to plant one hill at least one hundred feet from any other corn. After the plants have started, this hill should be thinned to one stalk, and it should be as carefully cultivated during the season as the others.

9. The Growing Plants. Study should begin as soon as the corn appears above ground. Lead the pupils to see the manner in which the leaf is rolled and to watch the plants from day to day, so they may discover the gradual unfolding of the leaves. It is well to have sketches made of the plants when they first appear above ground and again after about a week. (The accompanying illustration is that of a young plant.) These drawings should be made in a notebook in which all other corn observations are recorded. Do the new leaves start above or below the old leaves? How are the leaves attached to the stalk? (They form a sheath covering nearly the entire joint from which they spring.)

At the second examination it is well for each pupil to have a plant before him, but all further study should be confined to the growing plant where it stands.

The study of the stem naturally follows that of the leaf. A few questions will lead the children to see that the stem is slightly concave on one side, that the new shoots are smooth and the older ones rough because of the enclosing sheath, and that the stalk is jointed and enlarged at the end of each joint. They will soon discover also the different colors, varying from green to dark purple. How does the stem increase in length? Does it grow from the upper joint only or do all the joints grow? Which part of each joint grows? Why does the leaf sheathe this part? Why is this point tender? How does it taste? Why? How can you ascertain these facts? These problems will lead the class to see that they must make very careful and systematic observations. If the pupils are asked to measure the different joints in the stalk at regular intervals and keep a record of these measurements, they will be able at the end of the season to tell just how much each joint increased in length and also at what time in the season the growth was the most rapid.

Such a record is easily kept. Have the pupils select a number of stalks to be measured and fasten upon each of these, in a manner that will not injure them, a little numbered tag, as 1, 2, 3. Number the joints from the bottom upward as they develop. Having done this, the record can be kept on a page of the notebook ruled in this manner:

GROWTH OF JOINTS IN INCHES

STALK 1

DATE	JOINT 1		JOINT 2		JOINT 3		JOINT 4		JOINT 5		JOINT 6		TOTAL	
	Length	Growth	L.	G.	L.	G.	L.	G	L.	G.	L.	G.	L	
[illegible]	5		6		5								19	
6 8	8½	½	6¾	¾	6¼	1¼							22½	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					30	7

Since successive joints are added as the stalk increases in length, the later observations will contain a number of joints that do not appear at first. Construct a similar table for each stalk measured. At the end of the lesson compare the tables and see if you can tell why one stalk has grown more than another.

10. Tillage. When the plants are about six inches high, ask the pupils what must be done to them. What tools shall be used for this purpose in the garden? If the farmer has a large field, what does he use? Why? Why is tillage necessary? Doubtless all the pupils will see that the crop is cultivated to kill weeds, but it is quite probable that only a few, if any, understand the necessity of cultivation for the purpose of conserving moisture. This fact should be dwelt upon until all members of the class understand how the earth mulch prevents evaporation. A third reason is that plants throw off waste matter, poisonous to themselves. Cultivation makes the soil porous, and thus assists in oxidizing this matter, which, if allowed to accumulate in the soil, is injurious to the plant.

After the first tilling, the class should observe the plants from day to day, and the time for the second tilling should be determined upon in class, as far as possible. This is easily settled for the corn in the school garden, but home crops may vary so widely, because of conditions of soil and moisture, that it will be necessary to till some sooner than others.

As the season advances, the time to cease tilling should be determined upon. Ask the class why it is better to "lay the crop by" at this time. In answer to this question you should obtain the following facts: In fields where cultivators are used after the plants are half grown, the teams break the leaves, and, a still more important reason for ceasing tillage at this time, the cultivator disturbs the roots and reduces the productivity of the plant.

11. Flowers and Fruit. The pupils should be directed to watch for the appearance of the ears on the plant. Ask them to notice from what points on the stalk the ears grow and by questions lead them to see that the ear is an altered branch. Which ears appear first?

When the ears are formed, have each pupil break one from his plant and bring it to the class. Study the parts. Notice that the bracts, or husks, as they are commonly called, are altered leaves. Call attention to their arrangement on the shortened joints of the ear. Notice how they differ from the other leaves of the plant. What purpose do they serve? The husks overlap each other so as to protect the seeds from water and from birds.

Strip the husks from the ear carefully, so as not to disturb the silk. Have the pupils trace these fine, hair-like organs from the end of the ear to the point from which they started In doing this the children will discover that each thread of silk is joined to a rudimentary kernel. Tell the children that the silk is a hollow tube with an opening at the outer end which is exposed to the air. Why are these outer ends so sticky?

Following the study of the silk, study the tassel. Note the difference in structure between the tassel and the silk. The tassel is made up of spikes of staminate flowers. The ear is a single spike of pistillate flowers, each thread of silk being the style of a single pistil. The pupils will need to watch the development of these two sets of flowers and to notice how the pollen is scattered. When they discover this they can tell why the ends of the silk are sticky. What would be the effect if all the tassels were cut off before the blossoms opened? The study of pollination should seldom be carried beyond the point of the contact of the pollen with the silk. The other part of this process requires too minute study for children.

12. The Complete Plant. Lessons on the complete plant should be given soon after the opening of the fall term. The class should have before them several of the best plants that they have grown, taken from the ground so as to preserve the root system as completely as possible. This can be done by digging around the plant with a spade, lifting it bodily from the ground, gently loosening the soil around the roots and rinsing off the adhering particles. In connection with these stalks each pupil should also bring one of the stalks which he planted far from the others.

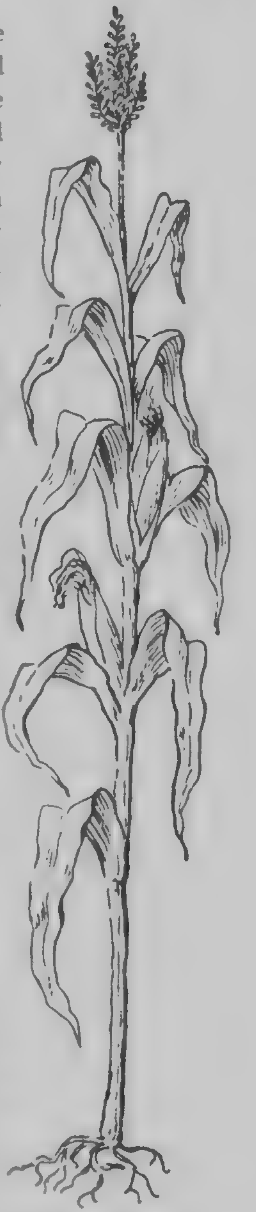
(a) BEAUTY. Notice the plant as a whole—its long, straight stem, its curving dark green leaves and its ears hanging gracefully down, which make it one of the most beautiful of plants. The many beautiful designs for decoration which can be made from corn should also receive attention. Encourage the pupils to invent designs and decorate the schoolroom with corn. After this is done, have a harvest festival and invite the parents.

(b) MEASUREMENTS. Measure the height of each stalk before the class. How many days between the date of planting and the day on which the plants were taken from the ground? What has been the average growth in inches per day?

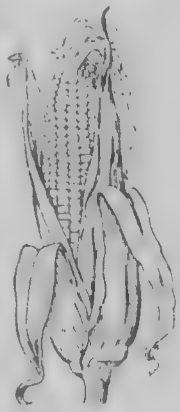
If convenient, have the plants weighed. At the average weight of these specimens, how much plant food is taken from the soil by an acre of corn? This problem can be solved with sufficient accuracy for all practical purposes in the following manner: Have the pupils cut into small pieces the stalk that has been weighed; place these in a skillet with a loosely adjusted cover, and heat over a fire until nothing but white ash remains. Then weigh the ash. The difference in weight approximates quite closely the weight of matter which the plant extracted from the soil. Have the pupils count the stalks on a patch one rod square; then multiply this number by the number of square rods in an acre, and multiply the product thus obtained by the weight of the matter extracted from the soil by a single stalk. When they have solved this problem, the pupils will realize as never before the value and necessity of fertilizers.

With mature classes the sources of food and the means by which this food is taken up and assimilated by the plant can be discussed with profit, but the teacher who would attempt this must have a reasonably thorough understanding of plant physiology, for the lessons will give rise to questions which, without such knowledge, she will be unable to answer.

(c) THE ROOT. Notice the extent of the root system, but in connection with this impress upon the pupils the fact that not all of the roots are attached to the specimens, since in their reaching out for nourishment the finer roots extend for several feet in all directions, and in removing the plant from the ground these are cut off. How do the roots compare with one another in appearance? Do any roots start from the stalk above ground? If so, what is the special use of these roots? Why is the stalk so large at the bottom? The answers to these questions will lead the pupils to see the adaptation of the plant to the strain that is placed upon it in case of a high wind or storm.


THE CORN PLANT

(d) THE STALK. Study the structure of the stalk. C one or more of the stalks across, so as to expose the cro section, and split one or more of the others lengthwise. Notice the different parts—rind and pith. The difference between these parts is that in the rind the bundles of fibrous tissue are smaller and closer together than they are in the pith. Compare the cross-section of the stalk with the cross-section of the branch of some tree. Lead the pupils to see that the stalk contains bundles of fiber scattered through the pith, but that its great strength is in the outer walls, while the branch of the tree is constructed on an entirely different plan. The corn is an inside grower, or *endogen*, while the branch is an outside grower, or *exogen*, because the new wood comes outside of the old wood, though beneath the bark. Why is the stalk so porous on the inside, and why is it solid at the joints? The answers to these questions lead to the principle in physics that a hollow tube has greater strength than a solid rod containing the same quantity of material, as a stove pipe six inches in diameter will sustain a greater weight without bending than an iron rod of the same length containing the same amount of iron. The solidity at the joints prevents the stalk from being easily bent or crushed; hence, in the combination of these two principles the greatest possible strength is given the stalk for the amount of material that it contains.



THE EAR

13. The Ears. How many ears on a stalk? How many on the stalks that were planted away from the others? How do the ears on these stalks compare in development? Now break the ears from the stalks, strip off the husks, and compare the ears. Count the rows of kernels. How many in each ear? Are all the ears equally well filled? If any are defective, what is the cause? The answer to this question will lead to a review of the planting, tillage and other conditions of growth during the season. Out of this discussion

ROOTS OF CORN

Photograph from Wisconsin Agricultural Experiment Station, Madison, Wis.

the pupils should see that those plants which had the best care, other things being equal, produced the best ears.

14. Varieties. After the class has made a thorough study of the plants with which they began, you should take up and discuss with them the different varieties of corn. Let them procure all the different kinds they can in the neighborhood. Doubtless they will be able to bring specimens of sweet corn and, in some localities, of popcorn. When all these collections have been made, the different varieties should be compared as to color, size, structure, and the length of time required for the plants to reach maturity.

After these questions have been settled, you should add the names and descriptions of such varieties as the pupils have not been able to obtain and lead them to see that each variety is specially adapted to the locality in which it is grown or the purposes for which it is raised. For instance, the large dent corn succeeds only in that portion of the United States which has long, warm summers, while the flint, or hard yellow corn, will mature as far north as the southern half of Ontario and the Northwest Provinces, and has always been the corn grown in the New England states. This variety succeeds in these localities because it does not require so long a season. Sweet corn is specially adapted to be eaten green and also for canning, while popcorn is grown as a luxury.

15. Where Grown. Under this topic the geography of the corn regions of North America should be discussed and the pupils should understand that most of the corn grown in the world is produced in North America, mainly in the United States. Following this, notice its cultivation in other countries, particularly in southern Europe, northern Africa and in Asia.

16. Uses. (a) HUMAN FOOD. Under this head discuss the manufacture of corn meal and the different articles of food prepared from it, such as corn bread, hominy and mush. The next important product is corn starch, in the manufacture of which several million bushels of corn are used each year. Numerous breakfast foods are also prepared from corn.

(b) FODDER. Lead the pupils to see that in the places where the most corn is raised, large numbers of cattle and hogs are fattened from fodder in the form of stover, and that it is especially valuable for feeding milch cows. This will lead to the study of the process of preparing this fodder by chopping it and placing it in air-tight enclosures called silos.

(c) OTHER PRODUCTS. The other uses of the grain are the manufacture of glucose or corn syrup, alcohol and other distilled spirits and corn oil. From the oil a variety of vulcanite, or corn rubber, is made.

(d) STALKS. The stalks are often used dry by farmers for fodder for cattle, and the pith is used in the manufacture of smokeless powder and for packing beneath the armor-plate of battleships. If a ball pierces the armor, the cornstalk pith swells and fills the opening so that the entrance of water is largely prevented. Other portions of the stalk are valuable in the manufacture of paper. The husks are used for the manufacture of paper, for filling mattresses and for packing fruit and other articles. In localities where corn is raised in large quantities and coal is scarce, the cobs are often used for fuel. Thus all parts of the plant are of value to man, and because of the great variety of uses to which it can be put corn is one of the most valuable of all the agricultural products.

17. Classification. Compare the complete plant with complete plants of wheat, oats and timothy or other grasses, for the purpose of having the pupils notice the points of resemblance in the general structure and manner of growth of these respective plants. By directing their attention to the structure of the stems, the way in which the leaves form sheathes around the stems, the general resemblance of the leaves and the joints in the stems, you should lead the pupils to see that in general structure all these plants resemble each other so closely that they must be members of one family.

All are grasses, but corn differs from the rest in having stamens and pistils on separate parts of the plant.

18. History. These lessons should bring out the facts that corn is a native of the warmer portions of America; that it was first made known to white men by Columbus, who, on the return from his first voyage, carried specimens of it to Spain; that for centuries it had been one of the chief articles of food for the American Indians and that the most advanced tribes, especially those in Mexico, were successful in its cultivation; that it was for many years one of the chief sources of food of the early colonists, especially in New England; that its development and perfection have been due to cultivation by white men, and that soon after its discovery in America it was introduced very generally into the countries of northern Africa and from there into Asia. The nations in southern Europe did not begin the extensive cultivation of corn for a long time after it was introduced into Spain by Columbus.[1]

19. Literature. The lessons on history afford the best opportunity for introducing the literary selections bearing directly upon corn. The most important of these are the Indian legend of the origin of corn, as told in *Hiawatha* (see "Hiawatha's Fasting" and "The Feast of Mondamin" in the poem). Following this are Whittier's *Huskers* and *Corn Song* and Celia Thaxter's *Maize for the Nation's Emblem.* These poems, at least, should be studied at this time, and selections from other writers can be used if time and opportunity afford. (See Section 3.)

20. Economic Study. The corn crop of the United States amounts to about 2,200,000,000 bushels each year, or four-fifths of the entire crop of the world. Were the corn of the United States all gathered into one huge pile, it would fill a trench thirty-five feet wide and thirty-five feet deep and extend from New York City to a point fifteen miles west of Buffalo.

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[1] In Europe generally, the word *corn* is applied to wheat and other cereals, the name *maize* being given to Indian corn, from the Indian word *mahys*.

Harvesting the corn and preparing it for market require the labor of the entire rural population of the great corn-producing regions for several weeks. Harvesters which cut the stalk from the roots, break off the ears and husk them are now in use, though the greater part of the harvesting and husking is still done by hand. From agricultural implement dealers, you can get pictures of the different corn harvesters, if the children are unable to see the machines.

After husking, the ears are placed in cribs, which are long, narrow sheds, having their sides made of narrow boards with openings between them for the passage of air so that the corn can readily dry. When dry, the corn is shelled or thrashed by machines driven by steam or gasoline engines. One machine will shell from 2,500 to 4,000 bushels a day. Only shelled corn is marketed. This is placed in local elevators or shipped to the great trade centres and then to manufacturing centres to be made into foods, starch, etc.

A bushel of shelled corn weighs 56 pounds. The largest freight car will carry 60,000 pounds. How many cars will it require to move the entire crop of the United States? Allowing 40 feet to a car, how long a train would these cars make? At 50 cents a bushel, what is the value of the crop? Learn from the latest crop reports the number of bushels raised in the leading corn-producing states. Do the same for Canada, and mark on a map of Canada drawn by each child and kept for this purpose the parts where corn is chiefly grown.

21. Applications. This plan can be used to study wheat, cotton, rice, oats, barley, flax, beets, potatoes, and all other important agricultural plants, with only such modifications as the difference in the nature of the study of the plant requires. The pupils should be able to use this entire plan, and before they leave this grade they should acquire a fair knowledge of all the great farm crops. (See *Coal*, Volume One, pages 287-289, Section 8.)

Such plants as the violet and the morning glory are much simpler and require less detail; they are therefore suited to the work with younger classes. The sunflower, the dandelion and other composite flowers should be studied by the older pupils.

Each class should study a few new plants each season. The plants should be selected and the work so planned as to have each series of lessons take up plants that are more complex and include more details of the plan, until the highest grade is reached. By making selections to include the most important families of plants, namely, the Crowfoot Family, the Rose Family, the Mustard Family, the Pulse Family, the Composite Family, the Mint Family, the Violet Family, and the Lily Family, the pupils when through the grammar grades should know the most prominent characteristics of these Families, and be able to recognize and name several plants belonging to each. With the older pupils the adaptability of plants to the regions they occupy should be brought out. A grass grows quickly, comes to early seeding and dies. These peculiarities make grasses the characteristic vegetation of regions of spring rains and long, dry summers, as forests are characteristic of rainfall well distributed through the year. When these facts are understood, the pupils can readily give the reason for grassy plains or forests in any particular region of the world.

22. Aids. The following books are helpful for both teacher and pupils:

Corn Plants: Their Uses and Ways of Life. Sargent. 106 pages. Houghton, Mifflin & Company. This is a concise history and description of the cereals used for food. The illustrations are numerous and helpful and the text contains much valuable and interesting information.

Great American Industries, volume on *Products of the Soil*. Rocheleau. 200 pages. A. Flanagan Company. This volume contains chapters on lumber, sugar, cotton, corn and wheat. Each chapter is a good type study of the subject treated.

By the same author, *Geography of Commerce and Industry.* 416 pages. Educational Publishing Company. This work treats of the chief agricultural products from economic and commercial viewpoints, and gives much information that all pupils should receive The illustrations show the most recent methods of handling the products described

Special Method in Elementary Science. C. A. McMurry. This work contains an excellent lesson on corn as a type study. For full description, see page 67 of this volume, Section 45

The teacher should have the following publications from the United States Department of Agriculture:

Farmers' Bulletin No. 298, *Food Value of Corn and Corn Products*

Farmers' Bulletin No. 80, *Corn Culture in the South.*

From the Illinois Agricultural Experiment Station, Urbana, Ill obtain Bulletin No. 87, *The Structure of the Corn Kernel and the Composition of its Different Parts.*

Bulletin No. 96, *The Testing of Corn for Seed.*

Bulletin No. 100, *Directions for the Breeding of Corn*

Bulletin No. 113, *Shrinkage of Ear Corn in Cribs.*

Also from the Agricultural College Extension Department, Urbana, Ill., the pamphlet entitled *Studies in Corn and its Uses.* This is especially valuable for the information which it contains about corn products and for plans for specific study of different parts of the plant

From the Iowa Agricultural Experiment Station, Ames, Iowa, procure Bulletin No. 77 of the Agronomy Section, *Selecting and Preparing Seed Corn.*

Write to the agricultural colleges and experiment stations, the department of agriculture of your province, and also the agricultural experimental farm of the Dominion at Ottawa for documents on corn and other subjects. The Department of Agriculture at Ottawa issues some books and pamphlets of great value which may be obtained directly from the department. The pamphlets of the United States are naturally the most complete, because that country is the greatest corn producer and is most interested in experiments with this crop.

THE STUDY OF BIRDS

23. Value. Birds, with their beautiful plumage, elegant shapes, graceful motions and sweet songs, are always a delight to children and to such grown persons as have had their souls opened to the charms of nature's most beautiful creation. In school work nothing can be more inspiring, and nothing better calculated to bring the teacher and pupil into ready sympathy, than an enthusiastic inquiry into the lives and habits of our friends of the air. Besides training the eye to observe quickly, the mind to perceive accurately, to classify and to judge, bird study gives the finest training to the aesthetic and unselfish emotions. Admiration for the beautiful forms and charming ways of the birds grows rapidly into love for them and sympathy with the hardships of their existence.

24. Time. There is no time during the school year when the study of birds cannot be made interesting. After the Christmas holidays the teacher may give occasional lessons in bird structure, teach the principal parts of a bird and assist the pupils to identify the permanent residents. This will take up the time approximately to the first of March. From then until the middle of May, a few minutes may be given daily, for the transient visitants and the summer residents come thick and fast. Bird songs, nesting habits, young birds and kindred topics occupy the time till the close of school in June. The autumn migration comes with the opening of school; but autumn and early winter may better be given to studying the relation of birds to man. (See pages 103-106, Section 42.)

25. Structure. For studies in structure and parts, a living bird is desirable in the schoolroom. A stuffed specimen is good, and its lifelike appearance will give zest to the study. A bird skin, however, will answer the purpose. If a dead bird is used, it should be treated with respectful tenderness by the teacher and handled gently by the pupils. There will be no difficulty in getting a specimen for study, if the pupils watch for it. In default of a better specimen, a pigeon or a chicken will answer well. Don't ask any pupil to kill a bird. Perhaps, however, you can have an English sparrow killed; but do not use the specimen if it is bloody or disgusting in appearance, unless you wish to create repugnance and point a lesson in kindness. With specimen in hand, study it from the plan given on pages 26-29. You ask the questions and let the children answer from examination of the bird. Encourage them to find out or to see that the answer is not yet determinable.

Do not carry the study too far with the class nor allow it to drag. Ten minutes is a long time for such a study as is outlined, if you become familiar with the form. Apply it to many birds, and always compare. Teach the pupils to study living birds (as many as possible) at home and in the field. The pigeon, hen, turkey, duck, goose, canary bird, parrot, blue jay, robin, woodpecker, chickadee, crow, and English sparrow, at least, may be studied almost anywhere.

26. Teacher's Preparation. The teacher should have a much more extended knowledge of birds than it is possible for her to present to the class, because this additional knowledge will enable her to answer many questions and give interesting information which would be impossible without it. The following diagram and outline, therefore, are given for the express purpose of guiding the teacher in her study. The diagram can be used with the class for the purpose of teaching the children the prominent parts of a bird, such as head, beak, crown, neck, throat, back, breast, wings, upper tail coverts, under tail coverts, primaries and secondaries. With beginning classes only the parts first named should be considered. The outline should not be used with the pupils; let them study after the plan given under *Field Work*, Section 31.

I. HEAD. Size? Shape? Height of forehead? Crest? Carriage?
    1. *Bill.* (Two mandibles.) Length? Width? Height? Shape? Tip? Nostril? Marks? Does the opening between the mandibles extend back beyond the base of the bill? Tongue?
    2. *Eye.* Position? Shape? Arrangement of feathers around it? How many lids? (Three.)
    3. *Ear.* Position? Arrangement of feathers?

II. NECK. Length? Carriage?

III. BODY. Shape? Size and shape of breast? Back? Length? (The length of a bird is the distance from the tip of its bill to the tip of its tail when the bird is lying flat on its back with its bill stretched backward.)

IV. WINGS. Joints? (Three.) Position of feathers? Length of outstretched wing to tip of feathers? (Compare the length of the bird with the distance from tip to tip of outstretched wings.) Are the wings straight or curved?

V. LEGS.

1. *Upper Joint or Thigh.* (Does this extend outside of the general skin that covers the body?) Length? Do feathers cover it entirely? What portion is exposed?
2. *Middle Joint* or *Tibia.*
3. *Tarsus.* Length? Round or flattened? Feathered? Scales? (Compare the front with the back.)
4. *Toes.* Number? Position (on a level? Do they point forward or back?)? Joined or free? Webs or appendages? Nails (Number? Shape? Length? Character?)?

VI. TAIL. Length? Breadth expanded? Shape of end? (Compare outer and inner feathers.)

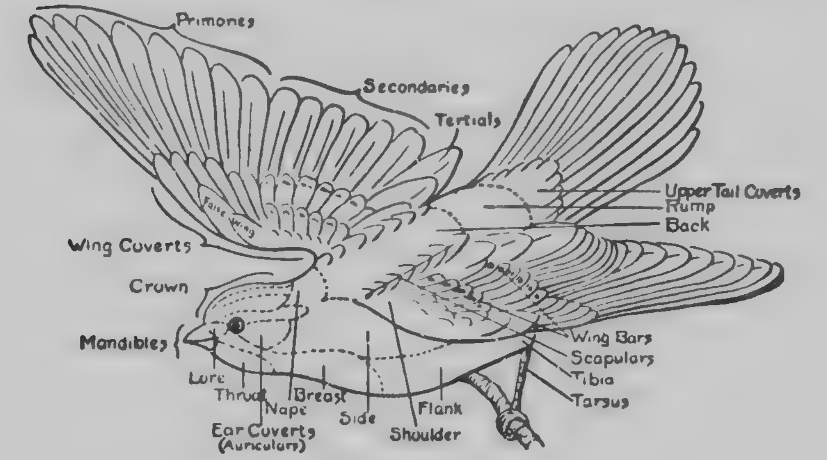
VII. FEATHERS. Color? Shape? Shaft? Vane? Symmetry? (Are the two sides alike?) Character (Rigid? Flexible? Soft? Satiny?)? (Select feathers from different parts of the body so as to get as great a variety as possible. Try to draw out the reasons for differences in shape and character of feathers on the different parts of the body.) Where are pin-feathers?

27. Written Exercises. The older pupils may be asked to copy the outline (Section 26) without questions and then to make a report on each bird they study by writing in the answers to the questions.

Require also written reports of these observations in your language classes. Teach the pupils to follow the outline, in order to have a logical arrangement, but to write smooth essays and to illustrate them by outline drawings of the bills and feet, at least.

28. Parts of a Bird. In describing a bird for identification, certain areas of the body are given specific names which may be learned from the diagram on page 24.

This may be placed upon the blackboard; pupils may copy it in their notebooks and then by drill lessons they must learn the words and be able to locate the areas instantly. While a complete diagram is here given for the benefit of the teacher, the attention of the class should be called to the most prominent parts only, as head, breast, wings, tail. There is danger that the inexperienced teacher will attempt too minute an analysis.



PARTS OF A BIRD

29. Classification. Birds may be separated into two great groups: first, those that live wholly upon land; second, those that live wholly upon the water or upon land and water. In most schemes of classification the water birds are placed first and are themselves separated into nine Orders. The land birds, which are grouped in eight Orders, comprise more numerous species and are the most easily studied. In determining to what Order a bird belongs, its bill, legs and feet are the things to be first noticed. In fact, by these alone most birds can be quickly assigned to their proper Order.

30. Land Birds. Land birds may quickly be classified into Orders by the following brief table:

Scratchers. Turkey, Grouse, Bobwhites. (Fowls.) Bill generally short, stout, hard and horny. Toes 4; hind one small, elevated above the front ones. (Live chiefly on the ground.) (Fig. 1.)

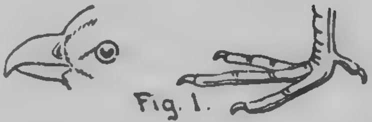


Fig. 1.

Pigeons. Pigeons and Doves. Bill rather slender, deeply grooved. Nostrils in a soft, fleshy membrane (cere). Toes 4, on a level; hind one as long as the shortest front one.

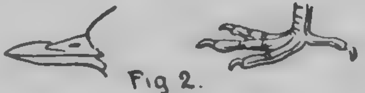


Fig 2.

Birds of Prey. Vultures, Hawks and Owls. Bill very stout and strong; upper bill with a sharply-pointed hook. Toes 4, 3 in front; all armed with strong, sharp, curved nails. (Figs. 3 and 4.)

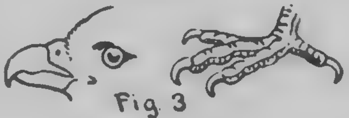


Fig 3

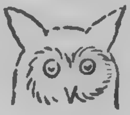


Fig 4.

Parrots. Bill strong; upper mandible projecting and strongly curved; cere. Toes 4, 2 in front and 2 behind. (Fig. 5.)

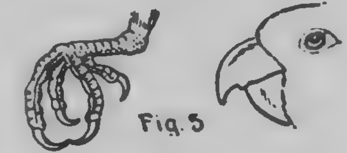


Fig. 5

Cuckoos and Kingfishers. Bill without a cere, straight or slightly curved. Toes 4, the middle and outer ones joined for half their length (kingfishers); or, 2 in front and 2 behind (cuckoos). (Fig. 6.)

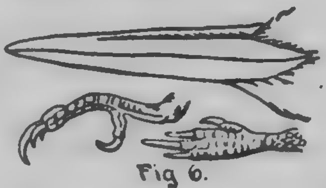


Fig 6.

Woodpeckers. Bill strong, straight. Nostrils more or less covered by bristles. Toes 4; 2 in front, 2 behind. Tail feathers stiff and pointed. Climb trunks of trees. (Fig. 7.)

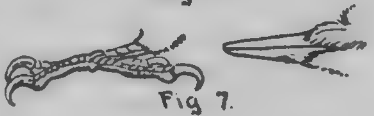


Fig 7.

Swifts and Hummingbirds. Bills short, small, and mouth large; or, bill long and exceedingly slender and mouth small. Feet very small and weak. Seen almost entirely in the air. (Fig. 8.)

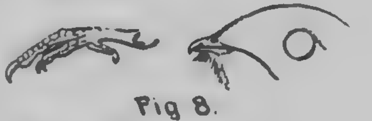


Fig 8.

Perching Birds. Bills various. Toes 4, without webs; all on the same level; hind toe as large as the middle one; nail generally longer than that of the middle one. (Fig. 9.)

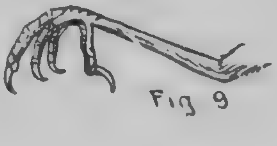


Fig 9

Among land birds the perching birds compose the great Order, and it is well to know the characteristics of the eighteen Families that compose it. These characteristics, however, may be learned as birds are identified one by one.

31. Field Work. The study of birds is preeminently an outdoor study and need not take much time from other school studies. The reports, the brief discussions, may be for the classroom; but the real work is done on the Saturday excursions, the Sunday walks, the trips to and from school and at recess and the noon intermission. When pupils have once been shown the charm of bird study, their sharp eyes will find material enough. If the teacher will but show a little enthusiasm herself, will only go out with the pupils and see, study and admire, all will be drawn together by a common interest, and the routine of the school will be much lighter.

In looking for birds, wear quiet clothing, especially avoiding white; go slowly and quietly; stand still and wait often for the birds to move. Keep the sun at your back, if possible, so you can be sure of the colors. Cloudy and rainy days are good, for birds never stay indoors long at a time. Early morning (before 7 a. m.) and late afternoon are the best times of day. But there are always some birds to be seen at any time. A good opera-glass is of great assistance, but it is not essential. Be *sure* in your sight or say frankly, "I don't know." It is very easy for anyone to be deluded into thinking that he sees what he expects to see.

32. Observations. It is always best to carry your notebooks with you and to record your observations on the spot where you make them. It is the easiest thing in the world to forget what you saw in those few exciting moments when you looked at the bird flitting about in the underbrush. Acquire the habit of making your notes systematically—setting down or remembering in order the facts you will need in identification. The following are the main points:

(a) SIZE. The size of a bird is his length. (See Outline, in Section 26.) Use a familiar bird as a standard—the crow, the robin or the sparrow. The English sparrow is 6 inches

BIRD STUDY

Photograph by Mrs. R. B. Fisher, Vergennes, Vt

MAKING A SCHOOL GARDEN

Photograph by Mrs. R. B. Fisher, Vergennes, Vt

long. You can, then, always put your bird into one of three classes: (1) Birds about 6 inches long; (2) birds decidedly less than 6 inches in length; (3) birds decidedly over 6 inches in length.

(b) HABITS. Notice carefully the sort of place the bird haunts—thicket, orchard, meadow, forest, swamp, etc. Watch the manner of flight, the place of lighting, the habit of feeding, the attitude when at rest, the motions of head, tail and body, the height from the ground at which the bird is seen and whether it is alone or with others. For the beginner, so many things may be confusing, but soon you will learn to recognize in a great many instances the Family to which a bird belongs, by his behavior. These facts will help you:

(1) *Woodpeckers*, alone or in pairs, climb up and down tree trunks, bracing themselves by their tails, heads up; *nuthatches* have similar habits, but are smaller, more erratic in their movements and often work head-downward; the *creepers*, about the size of a nuthatch, but more slender, usually work spirally up a tree from the bottom and then fly to the bottom of another.

(2) *Wrens*, alone or in pairs, are little brownish birds that flit in and out of crevices and bushes, carry their tails erect, and while singing perch on bushes in open sight.

(3) *Kinglets* are our smallest birds, restless and inquiring, that come early in spring, often in scattered groups.

(4) *Warblers* are gaily colored little birds, nearly always in motion in trees and bushes. There are many species that come in great numbers and rather late in migration, and after a few days most of them disappear to the northward.

(5) *Swallows* are usually seen flying in flocks in long, graceful turns near the water, by cliffs or about barns and houses.

(6) *Flycatchers* sit erect and watch for their insect prey, darting quickly and unerringly at it and then returning to the same or a nearby perch.

(7) Sparrows feed on the ground, often in large flocks, fly short distances only, and have thick, strong bills for cracking seeds.

(8) *Thrushes* run about alone on the ground, stopping suddenly to listen; some are very shy and keep to the dense undergrowths; others, like the robin and bluebird, are bold and confiding.

(c) COLOR. The male birds of most species are brighter than the females, though in some the sexes are colored alike,

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and in a few species the female is the brighter. Moreover, the plumage of most birds varies greatly with the season, sometimes to such an extent that the species may not be recognizable in the unfamiliar plumage.. The young are often colored differently from the old, and some birds do not get their finest plumage till they are two or three years old.

When the male is known, you will know the female and young by their being associated with the male. They differ from the male in color, occasionally differ in size and usually in song. Watch carefully for any marked color patches (especially lines through or over the eye), eye rings, wingbars and white in the tail.

(d) NOTES. Birds have call notes, notes of alarm and, during the mating season, songs of joy. Listen carefully to what you hear and associate the note with the bird. Some birds sing while feeding, others never do; some sing while flying, as they start or as they alight; others are always silent when on the wing; some call loudly when alarmed, others slip quietly away without a note.

(e) PHYSICAL MARKS. The size and shape of the bill, feet and legs, the length of the wings and the tail, the shape of the tail and such other facts as may be recognized should be noted.

(f) DATE. The date at which you see the bird may help you greatly in the identification of the specimen, as the migrating birds are very regular in their appearance and departure. Study your books about birds and you will soon learn to be on the watch for certain birds that may be expected in the different months.

33 **Identification.** You must not expect to make all the observations noted above on every bird; you will often have to content yourself with very few. But practice will enable you to see a great many things in a very short time; and in a majority of cases you can see enough to enable you to find the name of the bird in your book.

By far the best book for beginners in bird study is Chapman's *Bird Life*. Two excellent books for the identification of birds are two little pocket manuals in limp leather, by Chester A. Reed.[1] The birds are arranged in natural order. Each page contains a picture of the bird in a characteristic attitude, with the conspicuous patches in color. Besides the picture, there is on the page a brief description of the bird, its notes, its nest and its range. These are the practical, usable books that every beginner ought to have. They should be in the school library, and every teacher who wishes to learn about birds needs a set. If you can get but one volume, get the one on land birds. (For other desirable books for the library, see Section 43.)

34. Permanent Residents. Every locality has its little list of birds that remain throughout the year. These may be best recognized in the winter, when they are alone except for the few winter visitors from the north. In the latitude of Toronto and east of the Rockies, the following birds are about all that remain the year round. To the north the number will be less, to the south, more:

Bobwhite
Ruffed grouse
Red-shouldered hawk
Red-tailed hawk
Sharp-shinned hawk
Barred owl
Long-eared owl
Screech owl
Great horned owl
Hairy woodpecker
Downy woodpecker
Bluejay
Crow
American goldfinch
Purple finch
Song sparrow
White-breasted nuthatch
Chickadee

The flicker and meadowlark remain in some localities, and in others the waxwing passes the summer and the robin and bluebird the winter.

35. Winter Visitors. In the latitude of Toronto and east of the Rockies, some or all of the following may be seen as winter visitors:

Snowy owl
Prairie horned lark
Snowflake
Lapland longspur
Brown creeper
Redpoll
American crossbill
White-throated sparrow
Tree sparrow
Junco
Northern shrike
Winter wren
Golden-crowned kinglet

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[1] *Bird Guide.* Part I, Water Birds, Game Birds and Birds of Prey East of the Rockies. Reed. *Bird Guide.* Part II, Land Birds East of the Rockies. Both are published by Charles A. Reed, Worcester, Mass., and may be purchased from the Musson Book Company, Toronto.

36. Migration. The birds begin to arrive from the south late in February or early in March. The first birds come as soon as the weather permits, regardless of date, but the later birds arrive year after year on almost the same day. The height of the migration comes early in May and by the end of the month the migration is over. We cannot give a definite list that will be accurate everywhere, but the following approximation for the arrival of land birds in the vicinity of Toronto will be helpful. Not all the birds are listed, but these are common type forms or birds that are easily identified. North or south of the latitude of Toronto the birds will appear a little later or a little earlier. The names in italics indicate the birds most easily recognized.

	FIRST HALF	SECOND HALF
MARCH	Hairy woodpecker, *meadow lark*, *junco*, *song sparrow*, loggerhead shrike, *chickadee*, golden-crowned kinglet, prairie-horned lark.	*Kingfisher*, yellow-bellied sapsucker, *flicker*, phoebe, cowbird, *red-winged blackbird*, bronzed grackle, *American goldfinch*, fox sparrow, towhee, *cardinal*, brown creeper, white-breasted nuthatch, ruby-crowned kinglet, *blue-bird*, *robin*.
APRIL	*Mourning dove*, marsh hawk, sparrow hawk, white-throated sparrow, *chipping sparrow*, field sparrow, tree swallow, winter wren, hermit thrush, red-breasted nuthatch.	*Red-headed woodpecker*, *chimney swift*, kingbird, least flycatcher, vesper sparrow, white-crowned sparrow, *purple martin*, swallows (3 species), black-and-white creeper, warblers (10 species), *catbird*, *brown thrasher*, *house wren*.
MAY	*Whippoorwill*, *night hawk*, *bobolink*, *Baltimore oriole*, rose-breasted grosbeak, indigo bunting, scarlet tanager, vireos (5 species), warblers (20 species), *wood thrush*.	Cuckoo (2 species), *hummingbird*, orchard oriole, flycatchers (4 species).

37. Pupils' Records. The pupils will enjoy reporting the birds they have seen. On the bulletin board or blackboard may be placed in March a form like the following, which can be filled in from day to day till the end of May:

	E	DATE	OBSERVER	REMARKS			
				Number	Where	Weather	Later Reports
1	Robin	Mar 7	Jas Fay	1	Tree at home	Warm and clear	First nest found Apr. 1 First young seen Apr. 10
2							
3							
4.							

Encourage each pupil to keep for himself in his notebook from the first of March a daily record, or at least records of a day's observations as frequently as three times a week. The records of March may contain but three or four birds for each day, but in early May a good, bright boy may see from fifty to eighty different species in a day. After the leaves come out thickly and the migration passes, his list will fall off remarkably. The following is a good form for these personal records:

DAILY RECORD, SATURDAY, MARCH 27, 1909

(The birds marked * are those seen for the first time this year; those marked ** are identified for the first time.)

Weather. Cloudy and raw. Northeast wind

Place. Northwest along Crooked Creek, to Smith's woods and return by way of Dead Pond.

Time. Noon to 5 P.M.

1. Downy Woodpecker—1.
2. Bluebird*—1.
3. Junco—10.
4. Prairie Horned Lark*.
5. Robin—3.
6. Song Sparrow—2.
7. Tree Sparrow—Big flock.
8. Loggerhead Shrike**—1.

These lists are written at the time the observations are made, though many pupils will wish to copy them neatly on their return and preserve them to compare with lists of another year. When new or unknown birds are seen, the pupil will write his description in place of the name, and will try to identify the bird from the books at school.

38. Nests and Young. Late spring and early summer bring nests and young, and with them the almost irresistible inclination on the part of the boys to "collect eggs." Everything possible should be done to show pupils the cruelty and foolishness of this craze (the teacher will succeed better if she wears no bird plumage on her hat), to engender sympathy for the mother bird in her many dangers, and to inspire pleasure in watching the birds while they are nest-building and raising their young. The great variety, the structure and location of nests, the differences in color, shape, size and number of eggs furnish innumerable opportunities for good lessons full of *whys* and *wherefores*, in which teacher as well as pupil may watch and wait and learn from nature.

39. General Suggestion. We have attempted to give a general scheme for bird study that is applicable anywhere and at all times. In fact, it is a perennial subject which no teacher can exhaust in one grade or in one year. Year after year, as spring comes around, the interest in birds will revive, and every year both teacher and pupil will add to the list of their bird acquaintances. If a boy leaving the higher grades knows sixty birds at sight, he may have done well. Yet we have known boys of fifteen from city schools who, rising at daylight, tramped many weary miles into the country almost every Saturday during the season and who haunted the parks before and after school all the week. They shouted with delight over every new bird seen or old friend recognized. A hundred and fifty species of birds these boys considered a good spring's work; in a single day they reported more than eighty. They had been taught a little about birds every year from the primary school up; every year their knowledge and enthusiasm grew. Children of the villages and country have much better opportunities, and with a little encouragement will be equally enthusiastic.

40. Bird Enemies. Difficulties in finding suitable places in which to build their nests, suitable material with which to construct them and abundant food supplies for themselves and their young, are numerous and severe for our birds. Nevertheless, the active, wide-awake creature would conquer all these, even in many parts of our large cities, were it not for more direct and positive enemies for which we ourselves are largely responsible.

First and foremost among the birds' enemies comes the cat, whose natural instinct makes her most destructive among her natural prey. We have introduced the cat amongst the wild birds and left her free to prowl and hunt during the nesting season, while the young birds are defenseless and the old ones are driven by necessity to hunt for food, even in danger to their lives. It has been estimated that in the course of a year every cat allowed to run outdoors may be charged with the death of fifty birds. Probably the only thing that we can do in the matter is to set the children to watch, and encourage them to report the deaths they see. Perhaps in this way we can persuade them to select a better pet than the house cat, or at least to keep her indoors during the time the birds are nesting. If children will put into the nests where known, and rear when nest is not known, the helpless nestlings found on the ground, many lives will be saved.

Next to the cat, the English sparrow probably ranks as the greatest bird enemy. Not only do the sparrows seem to have a personal enmity against the wild birds and will join in mobs to repel the smaller ones, but from their habit of early nesting they seize upon the most valuable places long before our summer visitors arrive. While something may be said in favor of the English sparrow, yet every investigation proves conclusively that its chief food is that of its tribe and that it will neglect its opportunities among insects at any time to feed upon seeds and grain. Some sane and expeditious way of exterminating the sparrows should be devised.[1] In many places systematic efforts are being made to kill them off. Sometimes they are attacked during the nesting season and nests, eggs and young are heartlessly destroyed. True sentiment seems to prevent us from recommending any such course to pupils, and in fact it may be well to limit ourselves to encouraging observation and study of the English sparrow, his habits and his relationship to our birds, and allow his destruction to be carried out by other hands.

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[1] The inquiring teacher will find considerable information in *The English Sparrow in North America*, Bulletin No. 1. United States Department of Agriculture.

There are few places in the world now in which there are not laws protecting the wild birds, and every teacher owes it to herself to know the laws of the place where she resides and to see that the pupils understand them thoroughly. These laws properly explained are usually quite sufficient to prevent the boys from making their predatory excursions or at least to keep them within bounds. However, the passion for hunting and collecting has not been so destructive to birds as have the dictates of fashion. More than one species of beautiful birds has been made practically extinct by man's greed and the feminine passion for adornment.

41. Attracting Birds. Most of the wild birds are naturally of a friendly disposition, and if not frightened do not seem to object to the presence of man or his work. There are many species of the most beautiful plumage that will readily come near our homes, even in large cities, if we can offer them coverts for concealment, attractive places to build, give them material to build with and assure them of food for themselves and their young. When they find these things many birds will build their nests even close to a railroad track or within sound of the roaring wheels of a factory.

Here are some of the things which we can do towards the partial domestication of our friends of the air:

(1) We can put up bird houses on the schoolgrounds and encourage the children to put up others at home. A few plans for these may be seen in the accompanying illustration.

(2) We may see that they have plenty of good, clean water from which to drink and in which to bathe. In the country this may not be so necessary as in the city; but

the nearer the water supply is to the house, the closer the birds will come. In the city, clean, shallow water is hard to find, and birds will go a long way to get it. A large pan or dull-colored bowl with a roughish surface, in which are placed a few stones or something on which the bird may alight will, if it is filled every morning with fresh water, be almost sure to attract more than one beautiful wild bird.

BIRD HOUSES

(3) We can hang out bits of thread or string, pieces of cotton and hair for the birds that use such building material and if we want the robins to build near our city homes we can see that mud is offered them.

(4) In the winter time we can fasten in the trees around the schoolhouses pieces of suet and encourage the children to do the same at their homes. In this way they may be fortunate enough to secure daily visits from more birds than they thought were to be found in such cold weather.

42. Birds in Literature. All literature is rife with allusions to birds, and our studies will serve to make our interpretation of literature much more vivid. In addition to this there are a great many poems, anecdotes and essays of high literary merit that treat of some bird or some phase of bird life. The interested teacher will not have far to go to find abundant examples of these in the school readers or in the works of our standard poets. In many of the states there are published from time to time bird-day and arbor-day annuals which give many beautiful selections and suggestions at greater length than can be given here. An inquiry addressed to the state superintendent will usually bring a ready and helpful response. Your province may issue such literature.

When a teacher has once acquired the habit of associating or correlating her work in science and literature, she will find how helpful to both is such a plan. The pupil who reads *The Birds of Killingworth*, *To a Waterfowl*, or *Robert of Lincoln* goes to his bird studies with renewed sympathy and interest. After having seen the bobolink "swinging on brier and weed" and listened to his sweet song, the pupil will return to his reading lesson with increased enthusiasm.

43. Teachers' Aids. (a) BOOKS. There are numerous finely illustrated descriptive books which relate to birds, but which belong rather in the domain of literature than in that of science. We make no attempt to mention these. The teacher will find the following books very helpful; if possible they should be placed in every school library and kept accessible for ready reference:

Bird Guide. Reed. (See Section 33.)

Color Key to North American Birds. Chapman and Reed. 300 pages. Doubleday, Page & Co. A rather large book, which includes all the birds of North America. They are grouped in Orders, then the birds of each Order are arranged according to their coloring. Each bird is shown in characteristic attitude and his prominent color patches are rightly indicated. The *Bird Guide* takes the place of this volume east of the Rocky Mountains.

Bird Life. Chapman. D. Appleton & Co. A convenient book of about 300 pages. Simple in style; beautifully illustrated and contains excellent descriptions and a valuable key for identifying our common birds. This work is of great value to one beginning bird study.

Handbook of Birds of Eastern North America. Chapman. 418 pages. D. Appleton & Co. An illustrated book with a helpful introduction. Each bird is described in detail, and interesting facts are given concerning most of the species. This is an excellent book to use in connection with the *Bird Guide.*

Macoun's *Check List of Canadian Birds* and McIlwraith's *Birds of Ontario* are two volumes which will be found helpful in all the provinces.

Bird Homes. Dugmore. Doubleday, Page & Co.

(b) MAGAZINES. *Bird Lore* is probably the best of the ornithological magazines for school use. It is a small magazine published by the Macmillan Company at Harrisburg, Pa., and is the official organ of the Audubon societies. In each number is a directory of the Audubon societies and with the magazine come education leaflets which are of great assistance in school work.

One of the best things the teacher can do is to form an Audubon Society among the pupils. A copy of the magazine should be taken for the school, and some parents may order it for their children. Older children should be encouraged to make photographs for the magazine.

TEST QUESTIONS

1. Why is a knowledge of the principles of the various branches of physical science more necessary now than it was fifteen years ago? Give an original illustration proving your statement.

2. Show by concrete illustration how the study of plants helps a pupil to become self reliant.

3. State the advantages of making a thorough study of some important plant according to the plan given for the

study of corn. What animals in your locality can be studied in a similar manner?

4. What are the advantages of having pupils keep systematic records of their observations in all science work? Make a plan for a record for observations on wheat or cotton.

5. Of what value is drawing in connection with the study of such subjects as corn and birds?

6. What facts of the plan for the study of corn can you use with the geography class? In what other ways can you illustrate the relation of elementary science to geography?

7. Describe the habits of the English sparrow under the following heads: (a) attitude when at rest; (b) mode of flight; (c) manner of moving on the ground; (d) place of feeding; (e) relation to other birds.

8. Write a brief essay, not to exceed 300 words, on the subject of *Bird Migration.*

9. In what ways may the study of birds be made to influence the character of boys and girls?

10. State prominent traits that enable you to distinguish sparrows from swallows; nuthatches from other creepers; wrens from kinglets.

CHAPTER TWO

ELEMENTARY SCIENCE (CONTINUED)

STUDY OF INSECTS

INTRODUCTORY

1. Reasons for the Study of Insects. Insects constitute by far the largest number of living creatures. A conservative estimate places the number of species at five million, but some authorities claim there are many more. On every hand, in all climes, insects abound. There is scarcely a plant or part of a plant that is not subject to attack from them, and some of them constitute the most troublesome pests with which the farmer has to contend. Some are injurious to man; many species are among the most beautiful and wonderful of living things. These facts and the ease with which they can be procured point to the study of insects as one of the most interesting and useful lines of work in elementary science.

2. Material Required. The study of insects is facilitated if each pupil has the following outfit:

(a) AN INSECT NET. Procure four or five feet of No. 12 wire from a hardware store. Bend it around a flower pot or some other cylindrical object so as to form a loop about a foot in diameter, crossing the wire six or eight inches from the end and giving it two firm twists. Clamp this loop into a vise and twist the ends closely together. Take a broom handle or any other stick of similar size and fasten the twisted end of the wire into this handle. Procure about a yard of tarleton or cheesecloth, and make a conical bag having a mouth the size of the loop. The bag should be at least two and one-half times as deep as the frame is wide, so that it will lap over easily when the insect is caught. With a little care and skill one soon becomes expert in capturing insects with this little apparatus, and it furnishes the children with a great deal of sport and outdoor exercise.

(b) An Insect Cage. This is easily made by taking a cigar box or crayon box and cutting out the whole or a portion of one side and covering this part with wire screen. Cut a piece of glass and slide it in in place of the lid, so you can watch the insects. A pasteboard box will answer the purpose, but it is not so durable. Insects can be kept in one of these cages and studied until all of the changes which they undergo can be observed.

(c) A Collecting Bottle. This is most easily prepared by procuring a wide-mouthed bottle and placing in it a small quantity of absorbent cotton, enough to cover the bottom to the thickness of an inch. Procure a vial of gasolene and pour a small quantity on the cotton. Keep the bottle corked. The vapor of gasolene is poisonous to insects, and they die almost instantly when placed in the bottle.

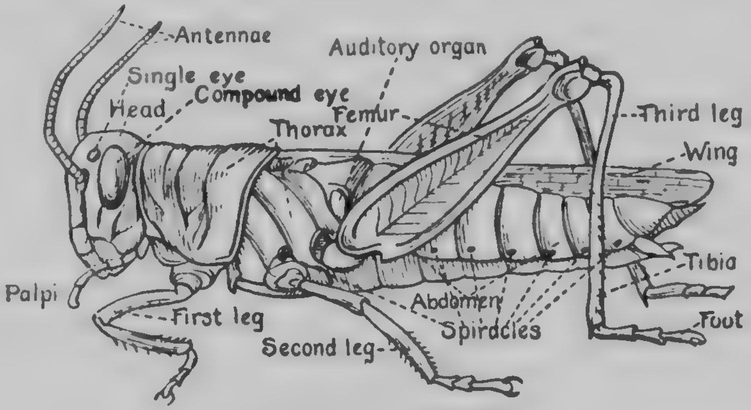
Caution. The vapor of gasolene is highly explosive, and both the collecting bottle and the vial of gasolene should be kept from artificial light and heat.

PARTS OF AN INSECT

3. General Structure. Insects are characterized by having their bodies divided into three segments—head, thorax and abdomen—each of which is distinctly separated from the others; by having three pairs of legs, all borne upon the thorax; and, in normal condition, two pairs of wings; however, one pair or both may be wanting. The blood is colorless or a greenish white, and the young are produced from eggs. A knowledge of their general structure is essential to the study of insects; therefore, the first work with intermediate classes should be the study of the parts of some insect easily obtained and of such size that the parts can be seen without the aid of a magnifying glass, though the use of the glass often adds much to the interest of the work. Dead specimens should be studied first, then living specimens of the same insect, for the purpose of seeing the working of the different organs.

4. The Diagram. The diagram here given is for the purpose of enabling the teacher to become familiar with the structure and parts of an insect. The grasshopper is chosen because it is common and large. Before proceeding to the lesson described below, you should study the grasshopper in connection with the diagram until you can readily locate and recognize all the parts named.

5. Preparation. Previous to beginning the lessons, have the pupils collect and place in their insect cages several full-grown grasshoppers. The largest species obtainable are the best for study. The insects must be fed daily with grass, and this should be sprinkled with water once or twice each day. Before the lesson have each pupil take a grasshopper from his cage and put it in the gasolene bottle. After the insects are killed and have been aired a few moments, distribute them to the pupils.



PARTS OF A GRASSHOPPER

6. The Insect as a Whole. Find the parts—head, thorax and abdomen. How are these separated from each other? How are they joined? How do the divisions of the body of the grasshopper compare with the divisions between like parts in the body of the cow, the dog, and the horse? These comparisons will bring out the fact that the divisions are much more distinctly marked in the grasshopper. Ask the pupils to examine other insects and ascertain whether or not this characteristic is true of them. Have them look up the word *insect* in the dictionary and see why the name is appropriate.

Look at the appendages. How many pairs of legs are there? To what is each pair attached? How many pairs of wings? To what are these attached? Have the pupils lay the grasshopper on its back and with a dissecting needle bring the wings out until they are nearly at right angles with the body. This work is the most successful if each pupil is provided with a piece of cardboard and several pins, so that the wings can be pinned in position.

7. The Head. What is its general shape? Have the pupils hold the grasshopper in front of them so they may look directly at its face; then turn the insect so as to obtain a side view of the head. What projections do you find on the head? What are those on the upper part usually called? The common name *feelers* will probably be given in answer to this question. For this you may add the term *antennae*. Notice the projections on the lower part of the head. These are sometimes called the mouth feelers; the more technical name is *palpi*. Where are the eyes? How many are there? Do you consider them large in proportion to the size of the insect? Notice the two kinds of eyes, the large, compound eyes on the sides of the head, and the single eyes, *ocelli*, between the compound eyes. Children can find these without a glass, if their attention is directed to them.

Examine the mouth. Lift the upper lip with the needle and notice how it is joined to the head. Cut or break it off. This brings to view the jaws, or mandibles. By moving these with the needle, pupils can see how they work. Dissect the mandible with the needle very carefully and find the tongue, a brown organ, between them. Take off the lower lip. This gives a still more complete view of the mouth organs within.

After this study of the head has been completed, it is a good plan to have the pupils cut the head from another specimen, lay it upon a piece of white paper, face upward, and make a sketch of the face.

8. The Thorax. Notice the shield, or cape-like collar, forming the first segment and extending over the other. Remove this carefully and count the other segments. What organs are attached to them?

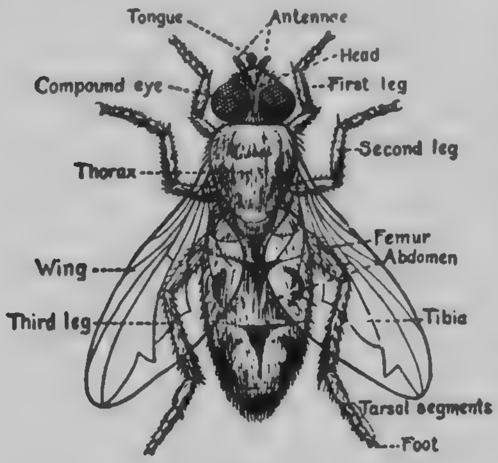
9. The Abdomen. Count the number of rings in the abdomen. Do all find the same number? Why can the grasshopper bend the abdomen? Notice the grooves on the under part.

Just above the grooves notice the row of small openings. These are breathing pores, called *spiracles*. How many are there? Are any similar openings found in the thorax? Can you see how these work in the living grasshopper? Could you drown a grasshopper by placing only his head under water? Why? The discovery of these spiracles will raise several questions in the minds of the children. With a younger class it is not advisable to go into details in explanation, but with the older classes the explanation of the intricate air tubes can be undertaken.

10. The Legs. Compare the three pairs of legs as to size. Which is the shortest? Which the longest? How many parts can you discover in the leg? Do you know the names of the parts of the leg in the human body? The same names are applied to the parts of the insect's leg. Can you tell to which part each name should be applied? Why are the legs of the third pair so much larger and stronger than the others? Is this true of all insects? Several days will probably be required to obtain an answer to this question. In how many ways does the grasshopper travel? How does the grasshopper make a noise?

11. The Wings. In what position are the wings when at rest? Which pair folds over the other? Which pair is the larger? Of what is the framework of the wings composed? What is the position of the wings when in motion? For what are they used? Have the pupils make a drawing of the different legs and of the wings, also a drawing of the complete specimen, before the lessons end.

12. Comparative. Study. Have the class examine in a similar manner the housefly, a butterfly, a moth and a May beetle (commonly known as the June bug), and see how many parts they can find and identify. Each pupil should make a list of the parts found as he examines the insect. From these observations a few comparisons can be drawn. Do all the insects which you have examined have the same number of wings? How do the wings of the beetle differ from those of the grasshopper? Do all these insects move about in the same way?



PARTS OF A FLY

Why is the June bug, or May beetle, so called? Why are these beetles found only during a brief period each season? Do you know of any other insects of which this is true? Why do we have grasshoppers, flies, mosquitoes and some other insects all through the season? These questions should be given one at a time. After one has been answered to the satisfaction of both teacher and class, another can be given. Each question calls for careful and systematic observation, and it is not probable that the class will be able to answer them all in one season. If properly guided, the pupils will solve for themselves all problems to which these inquiries give rise.

LIFE HISTORY AND CLASSIFICATION

13. Metamorphosis. Through the observations necessary to answering the above questions, the children will discover that some insects, like the butterfly, go through four changes, the egg, the larva, the pupa or chrysalis, and the perfect insect or adult, being the forms in which they appear during their existence; that others, like the chinchbug, undergo only partial changes, and that still others, like the grasshopper, appear from the egg in recognizable form. These changes are known as *metamorphosis*. An insect going through the four changes is said to have a complete metamorphosis. One having only a part of the changes has a partial metamorphosis.

14. Classification. Upon these distinctions and upon the number and structure of the wings, insects are divided into Orders and Sub-Orders. While a perfect classification has not yet been made, the following great Orders include all the insects usually met in the temperate regions. Classes in the grammar grades can learn the characteristics of each Order from observation, and after they have done this they should be able to tell the Order to which most of the insects common to their locality belong:

Dragon Flies, or *Nerve-winged Order* (Neuroptera). The insects of this Order have four membranous wings furnished with veins and numerous cross veins, giving them a net-like appearance. The larvae live in water and the metamorphosis is incomplete. All species feed upon other insects. The dragon fly and the ant lion are good examples.

DRAGON FLY

Grasshoppers, or *Straight-winged Order* (Orthoptera). This Order includes grasshoppers, locusts, crickets and cockroaches; the wings of the second pair are flattened lengthwise and laid straight when folded. The metamorphosis is lacking, or incomplete.

LOCUST

Bugs, or *Half-winged Order*. Many of the bugs have half of each wing in the first pair thickened like the wing covers of beetles, hence the name. The mouth parts are fitted for sucking. The metamorphosis is incomplete. The species are very numerous, and some, like the squashbug, the bedbug and the chinchbug, are well-known pests. The cicada is also a good illustration of this family.

CICADA

MAY BEETLE

Beetles, or *Sheath-winged Order* (Coleoptera). The beetles have an outer pair of hard wings called wing covers. The metamorphosis is complete and the larvae of some species are destructive. The May beetle, or June bug, is a good example.

HOUSEFLY

Flies, or *Two-winged Order* (Diptera). The members of this order have only one pair of wings and these are membranous. The mouth is fitted for sucking or puncturing, and the metamorphosis is complete. The housefly, mosquito and gnat are good examples.

MOTH

Butterflies, or *Scale-winged Order* (Lepidoptera). This order includes the butterflies and moths. Many of the species have large, showy wings, whose brilliant coloring is due to the feather-like scales with which they are covered. The metamorphosis is complete. The mature insect has a long proboscis, which, in the butterfly, is coiled when not in use. The larvae of some species are very destructive to vegetation.

HONEY-BEE

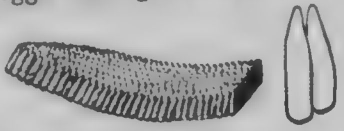
Bees and Ants, or *Membrane-winged Order* (Hymenoptera). This is one of the largest Orders and is estimated to include about one-fourth of the known species of insects. Bees and ants have four membranous wings, the first pair being the larger. Imperfectly developed females of some species have no wings. The metamorphosis is complete. Some species feed upon honey and others upon insects. This order includes the most intelligent and the most beneficial insects. Some of them, like the honey-bee, the wasp and the ant, live in colonies which have every appearance of well-organized communities.

THE MOSQUITO

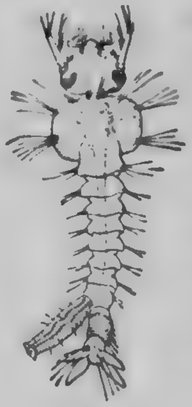
15. Life History. The life history or life story of an insect includes all the changes it undergoes from the egg to the adult (Section 13). The study of one insect as a type gives the class an idea of the life history of all insects belonging to that Order. The mosquito is a good type because all phases of its life history can easily be seen and because the insects can be obtained without difficulty.

16. Preparation. Dip a little water from the surface of the rain barrel or pool, running the dipper through the water much as you would a skimmer; pour the water into a glass fruit- or candy-jar; then dip some from the barrel so as to secure a number of wrigglers. Place covers of wire gauze or cheesecloth on the jars to prevent the escape of the mosquitoes.

17. Eggs. After a time examine the water carefully. You will doubtless find clusters of eggs floating on the surface. These come from the first water placed in the jar. These clusters are usually about a quarter of an inch in diameter and contain from two hundred to four hundred eggs, standing upon end and arranged in a single layer. The egg is shaped like a kernel of oats. With a good magnifying glass you will be able to see the structure of the cluster and the form of the single eggs. How long a time is required for the eggs to hatch?

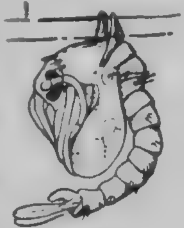


A CLUSTER OF EGGS



LARVA

18. The Larvae. Study the wrigglers. What is their shape? Place a few in a shallow white dish with just enough water for them to swim in, so that the pupils can get a good view of them. If you have several dishes for this purpose, it will facilitate the work. How long are the wrigglers? Why do they apparently hang head downward from the surface of the water? How long do they live as wrigglers? What do they eat?



PUPA

19. The Pupae. What objects besides wrigglers and eggs do you find in the water? Do these objects bear any resemblance to the wrigglers? What change do they undergo? How long a time is required for this change to occur? Notice that the wriggler rests in the water with the head downward, with the other end of the body at the surface, while the pupa has the head upward, for the same reason—that it may breathe the taken-in air through the posterior extremity, and the pupa through the head.

20. The Perfect Insect. Notice when the mosquitoes first appear on the cover of the jar. Study the mosquito as a whole. How many wings does it have? How many legs? Are all the legs of the same length? Can you see the eyes? How many are there? The compound eyes are easily seen, and with a good glass a simple eye can be discovered. How does the mosquito bite? What does it feed upon? Examine the mouth organs with the magnifying glass. What is the shape of the proboscis?

How many kinds of mosquitoes appear? Are all equally annoying? The males are distinguished by carrying large, bushy feelers, those of the female being much more delicate. The distinction is easily made by the naked eye. The males are harmless, and it is only the females whose bite is annoying. Can the mosquito walk upon the water? Why do mosquitoes multiply so rapidly? Why do we have mosquitoes all summer? Why are they more numerous in some localities than in others? Have the pupils examine the region around the schoolhouse and the regions around their homes, in a search for breeding places.

21. Destruction of Mosquitoes. The lessons on the mosquito should be turned to practical account as fast as possible. Remove the wrigglers from the glass globe or the largest jar, and place them in another jar. Empty the first jar and place some pebbles and clean sand in the bottom; then add two or three plants taken from a pond or stagnant pool. Fill this jar with water to within two inches of the top. Place a goldfish in the jar containing the sand and pebbles. Collect a quantity of wrigglers from the other jar and pour them into the jar containing the fish. What

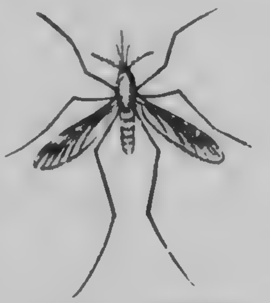
ADULT MOSQUITO

occurs? Perch and a few species of minnows will also eat the wrigglers, but only a very small number are destroyed in this way, so other measures must be adopted for their extermination.

Sprinkle a few drops of kerosene on the water in the other jar? What effect does it produce upon the wrigglers? If any mosquitoes are on the cover, dislodge them. What happens when they touch the water?

One ounce of kerosene to every fifteen square feet of surface is sufficient to exterminate all mosquitoes and wrigglers in any body of water. Lead the pupils to see how, by united effort, nearly every community can rid itself of these pests. Whenever possible, stagnant pools should be drained.

22. Mosquitoes and Disease. The species of mosquito most common in temperate regions is considered harmless. Another species, however, found in nearly all parts of the country, causes malaria by its bite. The malaria-bearing mosquitoes can easily be distinguished from the common species by noticing the following points: The wings of the common mosquito are clear, while those of the harmful species are spotted. The palpi of the common species are short, while those of the malarial mosquito are nearly as long as the proboscis. Any child old enough to study the mosquito can recognize these differences. In connection with this topic, ask the class to learn what they can about mosquitoes carrying yellow fever in Cuba and other tropical countries.



MALARIAL MOSQUITO

23. Applications. The life study of the mosquito prepares the class for a like study of other insects. The housefly should receive its share of attention. No attempt to breed flies should be made, but the children should be led to understand thoroughly that wherever filth is allowed to accumulate, breeding-places for flies are found, and that the best way to prevent their multiplying in large numbers is to keep everything about the premises clean. The danger to health from flies is seldom realized. They sometimes convey typhoid fever, and they contaminate with filth everything which they touch. Impress upon the pupils the importance of keeping the home free from flies.

The honeybee, the wasp and numerous species of butterflies and moths afford interesting and profitable studies which can be pursued in accordance with the plans given above, making only such modifications as the life history of the insect requires. The relation of insects to agriculture is considered in the lesson on that subject, later in this volume.

24. Aids. The following works are helpful in preparing lessons on insects:

Nature Study and Life. Hodge. Pages 4 and 5. (Section 44.)

Farmers' Bulletin No. 155, United States Department of Agriculture: *How Insects Affect Health in Rural Districts.*

The Study of Nature. Schmucker. J. B. Lippincott Co.

STUDIES IN PHYSICS

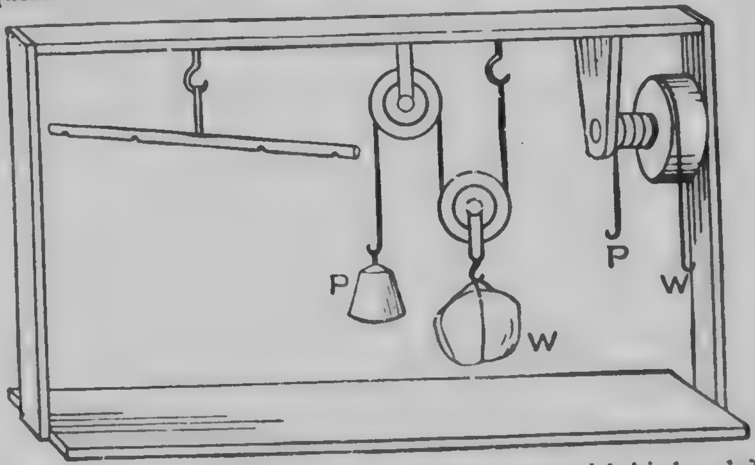
INTRODUCTION

25. Explanatory. The exercises in physics are designed for pupils in the grammar grades, and those on the mechanical powers should not be attempted with classes that have not done at least a half-year's work in the seventh grade. The exercises include those subjects in physics which the pupils most need, and they are chosen with a view to their practical application to everyday affairs. The teacher should have at hand a good modern text-book in physics, and unless she is thoroughly familiar with the subject she should work out very carefully each exercise before presenting it to the class.

MECHANICAL POWERS

26. Machines. The older boys are always interested in machines. However, but few of them will understand what a machine is, or that the most complex machines are composed of a few simple elements ingeniously joined together. These elements, to which the term *mechanical powers* is generally applied, are the lever, the wheel and axle, the pulley, the inclined plane, the wedge, and the screw.

Arouse an interest in these mechanical powers by such questions as these: Does a machine create power? Why can a man do more work with a machine than with his hands? Does a machine do its work better than a skilled workman?



For convenience in illustrating the principles of mechanical powers, you need a frame like the one in the illustration. This is made by taking an inch board nine or ten inches wide and two feet long, nailing to each end upright pieces five inches wide and sixteen or eighteen inches long and then joining the tops with a piece of the same width.

The frame should be strongly nailed, since it will be subject to considerable handling and more or less strain. The illustration shows the lever, pulley, wheel and axle in place. The class should also be provided with screw-eyes of medium size, a number of wire hooks which can be screwed into a support, some six-penny wire nails, a few screws and some pieces of stovepipe wire.

27. The Lever. Have each pupil procure a piece of lath at least eighteen inches long. The lath should be planed on all sides. With a pencil draw a line through the middle, from end to end. With a rule mark the lath off into sections six inches in length, then subdivide each of these sections so that the marks will be three inches apart. With a brad or a nail make holes through the lath on the middle line where each of the section lines crosses it. Place a nail through the hole in the center. Put screw eyes into the top of the frame, near enough to each other so that the lath can be supported by resting the nail upon them. If the lath does not balance, have the heavy end whittled carefully until the lath will remain in a horizontal position when on the support.

Have each pupil prepare two scale pans, using covers from tin boxes. The covers for each pair should be of equal size and as near the same weight as possible. Punch three holes in the rim of the covers so as to divide the circumference into three equal parts. Insert fine wire or linen twine in these holes; bring the three strands to a point and fasten them together. A hook made of stovepipe wire should be attached to the strings where they are tied together. Place nails in each of the holes in the lath. Hang the scale pans successively upon the nails, beginning with those at the end of the lath and working toward the center. See that the lath balances with the scale pans in each position. You now have a balance which can be used to illustrate the power and the principles of the lever. By using dry sand for a weight, a great many delicate tests can be made with this simple apparatus. Teach the parts of the lever—fulcrum and arms. Teach the names of the forces which operate upon the lever. The weight which is used to move the load is called the *power*. In the illustration, P means power; W, weight

With the scale pans equally distant from the fulcrum, how much weight in one is required to balance the weight in the other? Hang one scale pan on the end of one arm and the other half-way between the fulcrum and the end of the other arm, and balance with sand. Place a given weight in the first scale pan. What weight is required in the second to balance it?[1] Perform experiments by placing the power and weight at different distances between the fulcrum and the end of each lever arm and determine the exact weight required in each scale pan to balance the weight in the other. Notice the difference in distance through which the power and load move when the arms of the lever are raised or lowered. How do these distances compare with the weights in the two scale pans? Which weight moves over the greater distance? Measure the distance carefully and multiply each weight by the distance through which it moves. Compare the products. What do you discover? Have this exercise repeated a sufficient number of times to enable the pupils to understand thoroughly the principle of the lever. When this is understood, indicate it by the formula placed in the form of an equation:

Power multiplied by the power arm equals weight multiplied by the weight arm, or, power multiplied by the space through which it moves equals the load multiplied by the space through which it moves.

The next step consists in using and testing the different classes of levers. In how many ways do men use a crowbar? Illustrate by the lath or by a pencil or ruler. What is gained in using the crowbar in these ways? What is lost?

Place the power between the fulcrum and the weight. What is gained by this arrangement? What is lost?

Have the pupils discover and report the different classes of levers and their uses in tools and machines with which they are familiar; also have them discover the principle upon which the weighing scale is constructed. Why can you balance a load of coal or a load of hay with the weight of your hand on a platform scale?

Give problems such as these:

1. A man and a boy are carrying a weight of 100 pounds

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[1] Weights for use in these exercises can be prepared by obtaining sheet lead from tea chests and weighing it out in half ounce, ounce, two ounce and four ounce packages and rolling the lead together, or by taking bottles of different size and filling them with sand until the desired weight is obtained. This will probably have to be done at a store, for schools are not usually provided with weighing scales.

on a pole 12 feet long. Where must the weight be suspended that the boy may carry only one-third of the load?

2. A crowbar is 4½ feet long. The fulcrum is placed 6 inches from one end. What power will be required to lift a load of 1000 pounds? If the man's hand moves down one foot, how far will the load be raised?

3. Two boys have a plank 12 feet long, which they wish to use as a seesaw. One boy weighs 100 pounds and the other 75. At what point in the plank must the support rest in order that the boys may balance each other?

28. Wheel and Axle. Thrust a nail through the hole in the center of the lath and, using this for a pivot, with a piece of crayon resting against one end of the lath describe a circle on the blackboard. Without moving the lath from its position, describe another circle, holding the crayon six inches from the center. The large circle represents the circumference of a wheel and the small one the circumference of an axle. How do the distances from the center to each of the circumferences compare with the arms of the lever? If a load of 100 pounds is attached to the axle, what power will be required to balance it on the wheel? How can you solve this problem? What is the difference between the wheel and axle and the lever?

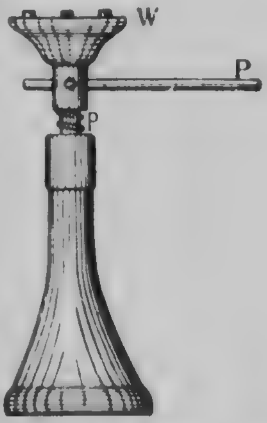
If any of the pupils have access to a turning lathe, it is well to have this piece of apparatus constructed. By making the wheel six inches in diameter and the axle two inches, you will have a machine with proportions which can be used without involving fractions. Mount the wheel and axle on the frame as illustrated in Section 26. When the power is attached to the wheel, what is gained? What is lost? When the power is attached to the axle what is gained? What is lost? What machines have you seen with the power attached to the axle? What is the reason for this arrangement? What machines have you seen with the power attached to the wheel? For what are these machines used?

29. Inclined Plane. Take a plank or joist, place one end on a wagon-box and let the other end rest on the ground.

Why is it easier to load a barrel of flour by rolling it up the plank than by lifting it into the wagon? If the plank is 12 feet long, the wagon 3 feet high, and the barrel weighs 200 pounds, what power will be necessary to roll the barrel into the wagon? An arrangement like this is called an inclined plane. See how many illustrations and uses of the inclined plane you can discover. Why do roads wind around hills? Why do railways in mountainous regions contain so many curves? The wedge is a form of inclined plane. For what is it used? How is the power usually applied?

30. The Screw. Cut from a sheet of white paper a right-angled triangle having a base eight or ten inches long and an altitude of two inches. Draw a heavy pencil line along the longest side of the triangle. Wind the triangle around a pencil, beginning with the wide end and keeping the lower edge of the paper even with the end of the pencil. What part of a screw does the black line represent? What, then, is a screw, mechanically considered? (A screw is an inclined plane wound around a cylinder; or, a rolled inclined plane.) If you can, secure the loan of a small jackscrew. If this cannot be obtained, a small vise will answer the purpose. With the screw in hand, teach the class the different parts—the thread; the body, which is the cylinder of the screw, and the pitch, or interval, which is the distance between the threads.

Consider the cap of the jackscrew or the movable jaw of the vise as a load. How far does the load move at one revolution of the screw handle? The power is applied at the end of the lever. How far does the power move in one revolution of the screw? (The last question, of course, is based upon the supposition that the pupils are able to find the circumference of a circle when its diameter or radius is given.)



THE JACKSCREW

W, weight, or load; P, power; p, pitch

Can you see why with so small a power you can lift so large a load with a screw? Ask the pupils to observe the different uses to which the screw is put. After they have familiarized themselves with these uses, give occasional problems, such as the following:

1. If a screw has a pitch of ⅛ inch and the power is applied to a handle 3 feet long, what load will a power of ten pounds lift? Through what distance will the power move in making one turn of the screw? How far will the load be raised?

2. A screw having a pitch of ⅓ inch is worked by a lever that describes a circumference of 8 feet. How great a pressure will a power of 15 pounds produce? How far does the power move the load?

3. A jackscrew has a pitch of ¼ inch and a handle 15 inches long. What power will be required to lift a load of 100,000 pounds?

Which will lift the greater load with a given power, a screw with a large or small pitch? Why? Why is the screw particularly suited to the purposes to which it is applied?

31. Other Mechanical Powers. The foregoing exercises are typical of many that can be given on the mechanical powers. With these plans give lessons on the inclined plane, the wedge and the pulley. Before the exercises end, the pupils should be made familiar with all of the mechanical powers. In connection with each power given, use practical problems similar to those given above and lead the pupils to connect their arithmetic work with these and other lessons in physics. Problems relating to the exercises in physics can often form a part of the arithmetic lesson when the class is engaged upon that part of the subject to which such problems naturally relate.

GASES AND LIQUIDS

32. Elasticity of Air. If you can procure a quill, make a common popgun, or procure a toy airgun. Why is the cork or the pellet expelled with such force? Have you ever seen airguns used for shooting game or shooting at targets? Why are they effective?

Take a bicycle pump, hold the finger tightly over the end of the delivery tube and press down upon the piston handle. Why does the piston rise when the hand is removed?

These experiments and queries will call attention to the elasticity and expansibility of air; the pupils should look for other illustrations.

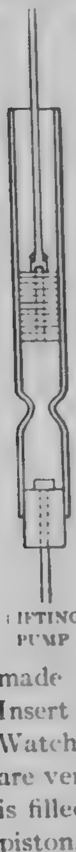
Why does the barrel of the bicycle pump become warm while pumping up a tire? (Compression of air raises the temperature.) Can you find other illustrations of this principle? If air is expanded, how will its temperature be affected? Feel the air as it is let out of an inflated bicycle tire. What do you notice with respect to its temperature?

33. Pressure of Air. Fill a tumbler with water, place a card over the top, quickly invert the tumbler and remove the hand from the card. What keeps the water in the tumbler? Try the experiment with the tumbler only half full of water. What is the result? What would be the effect if a barrel full of water with a tight cover were inverted in a similar manner? Why?

Take a small tumbler or a small bottle having a large mouth, place in it a little cotton so pulled apart that the fiber will burn easily. Ignite the cotton and place the palm of the hand quickly over the mouth of the bottle. Why does the bottle adhere to the hand? How do you account for the drawing sensation produced by the bottle? Try the same experiment, inverting the bottle over a saucer of water. How much water is drawn up into the bottle? Why?

These experiments show that the air exerts pressure in all directions. The pupils should now learn that this pressure at sea level is equal to about fifteen pounds per square inch, and that it diminishes as the altitude increases. If they can ascertain these facts for themselves, have them do so; if not, state the facts to the class.

34. Pumps. A very effective lifting pump can be made after the following plan: Procure a lamp chimney, such as is used on a student lamp, a spool that is of the right size to slide easily up and down in the tall part of the chimney, and a large cork that will fit tightly into the bottom part of the chimney. Soak the spool in water over night, then screw into one end of it two small screw eyes with long screws. Take a piece of pine about a half-inch square and fifteen to eighteen inches long; fashion it so that one end of it will just fit between the screw eyes. Place this in position and fasten it with two small screws, one through each screw eye. Just underneath this stick, and over the hole in the spool, tack a piece of thin leather or thin rubber about the shape and size of a dime. Use only one tack and drive this as near the edge of the leather as possible. Wind the spool with cotton twine or some other thread, so it will form an airtight piston to the chimney. Cut a hole through the center of the cork, and over this place a piece of leather like that placed over the hole in the spool. If you can procure a glass drinking-tube from a drug store and insert this in the cork, it adds interest. The cork should be made airtight. If necessary, cover it with wax or paraffin. Insert the tube in a vessel of water and work the piston. Watch the action of the valves. You will notice that they are very sensitive, and that as soon as the barrel of the pump is filled with water they yield to the slightest motion of the piston. Ask the pupils to compare this pump with those at home and see whether or not the two are constructed on the same principle. Will the lifting pump raise water to any desired height? Why?



LIFTING PUMP

A cubic foot of water weighs 62.4 pounds. What is the height of a column of water one inch square that will weigh 15 pounds? The solution of this problem will give the height to which water can be raised at sea level; but the pupils should be shown that this result is theoretical, and that because of imperfections in the pump, especially leaky valves, the actual height is a little less than this.

Mercury is 13.6 times heavier than water. How high a column of mercury will the pressure of the air sustain at sea level? The solution of this problem naturally leads to the discussion of the barometer. If one can be obtained it is well to explain its facts and principles at this time, and have the pupils study it for a few days to notice the variation in the height of the column of mercury.

How can we raise water to any desired height with a pump? How does the fire engine throw such a powerful stream of water? From the study of the lifting pump, lead the pupils to construct a force pump, making only such changes in the apparatus as are necessary. An air chamber can be added to the force pump by taking a bottle with a large mouth and fitting it with a cork, through which two openings are made, one for the tube leading from the force pump and the other for the delivery tube leading to the vessel into which the water is discharged. Of what advantage is the air chamber? For what are force pumps used? To which class does the bicycle pump belong? Can compressed air be used for operating machinery? Why?

Call the attention of the pupils to the fact that air is typical of all gases, that all possess elasticity, that they can be compressed and that when external pressure is removed any gas will expand to fill the space within which it is confined. By cold and pressure many gases are changed to liquids. Can air be so changed?

35. Pressure of Liquids. The pupils have learned the weight of water. Procure a cylindrical pail or can and fill it with water. What does the pressure on the bottom equal? (The weight of the water.) How can we compute the pressure on the side? To answer this question the pupils must know how to find the convex surface of a cylinder; therefore, if a rectangular vessel can be obtained it simplifies the problem. Let the pupils discover the principle upon which this problem is solved, by such questions as these: What does the pressure

MICROCOPY RESOLUTION TEST CHART

on the side where it unites with the bottom equal? What is the pressure at the surface? How can we find the average pressure for the side?

When the principles for finding pressure are understood, interesting problems involving their use can be added to the mensuration work in arithmetic; also lead the pupils to see the practical application of these principles by asking such questions as, Why are dams made so strong at the bottom? Why can water be used to operate machinery? Upon what does the power exerted by the water depend?

36. Buoyant Force of Liquids and Gases. Take one of the laths used in illustrating the lever, run a nail through the hole in the center and place it in the hooks on the frame. Attach scale pans to each end so as to form a balance. Suspend a small stone from one scale pan by a string at least four inches long. Place in this scale pan a small vessel that will hold a quantity of water, at least equal to the volume of the stone. Place weights in the other scale pan to balance; fill a vessel full of water and set this in a larger vessel; then move the apparatus so as to immerse the stone in the water. What happens to the opposite end of the scale beam? Leaving the stone immersed in the water, remove the larger vessel and pour the water which ran over into it in the small vessel in the scale pan. What effect does this have on the balance? How much do you think the stone loses in weight when immersed in water? Is it easier to lift a large stone under water than in the air? Why? From the experiment the pupils ought to be able to answer all these questions.

Why does wood float on water? Why does iron sink? Why will an iron kettle float? Will it float with a weight in it? Why will large iron ships float and carry heavy loads? How can you determine the load that a floating body will carry without sinking?

Procure a paper balloon. Inflate it out of doors with hot air. Why does it rise? If you wish to recover the balloon, hold it captive by a string attached to the frame. Why will a large balloon float and carry several people? How high can a balloon rise? Why does it stop rising? These experiments and questions call the attention of the pupils to the buoyant force of liquids and gases and the practical uses which are made of this force.

37. Other Lessons. Use similar plans for lessons on sound, light, heat and electricity. Use a good text-book in physics as your guide. Construct simple apparatus and keep the work within the capacity of the pupils. With the employment of such means the pupils of the grammar grades should, before completing their work, have a fair knowledge of the elementary principles of physics.

STUDIES OF THE WEATHER

38. Importance. Changes in weather occur according to the operation of certain fixed laws which control atmospheric phenomena. Many of the underlying principles upon which these changes depend are easily understood, and a knowledge of them enables one to forecast the weather of one's locality for several hours with a good degree of accuracy. Ability to do this is of practical value, and an understanding of atmospheric phenomena and the principles upon which they depend dispels superstitions about the weather. Moreover, exercises of this nature are always interesting.

39. Winds. How is your schoolroom warmed? How is it ventilated? If a furnace or a jacketed stove is used, have the pupils test the direction of air currents in different parts of the room. For this purpose use strips of thin tissue paper about one foot long and two inches wide. Where are the upward currents? Why are they in that part of the room? Where are the downward currents? How do you account for them? Of what use is the chimney to a lamp? What is the direction of the air current in the chimney? Why?

If you build a fire out of doors, will it create currents in the atmosphere? Draw a diagram illustrating the directions which these currents will take. The answers to the above questions and solutions of the problems to which they give rise should make clear to the pupils the cause of currents in the atmosphere. When these causes are understood the class is prepared to study the weather. Observations should be made systematically and carried through the term, a daily record being kept of the temperature, winds, condition of the sky, and the state of the weather. This can be recorded in two ways—by using tables prepared for the purpose and by constructing a weather chart upon which each of these facts will be graphically represented. These exercises will occupy but a few minutes each day, but they will need to be supplemented now and then by a special lesson.

WEATHER RECORD, JUNE

DAY	DATE	TEMPERATURE	WIND		SKY	WEATHER
Sat.	1	68	S W	Mod	A. M Clear P M Cloudy	A. M. Fair Even. Showers
Sun.	2	80	S W	Strong	Cloudy	Rain
Mon.	3	65	N. W.	Mod.	A. M. Cloudy P. M. Clear	Fair

Begin the work with the following questions: What is wind? How is wind caused? Why is wind much stronger at some times than at others? From what direction do the prevailing winds come?

Winds are horizontal movements of the atmosphere and are caused by the uneven temperature of different regions. Lead the pupils to apply the principles learned in connection with the study of warming and ventilating the schoolroom to the circulation of the atmosphere in general. Observe the order in which winds change. For the same locality this seldom varies, and over the greater part of North America it is from southwest to west, northwest, northeast, east, south and southwest; that is, the great movements of the atmosphere are rotary, turning in the direction of the hands of a watch when the dial is in a horizontal position. What is the effect upon temperature caused by this variation of the winds? Do the prevailing winds come from one direction in summer and from another in winter?

40. Humidity. Procure a shallow pan with square corners. An ordinary cake tin will answer the purpose. Pour in water to the depth of one inch. Set the pan in the schoolroom where it will not be specially affected by heat or winds. Have the pupils observe the gradual lowering of the water. How many days are required for it to lower one-half inch? At the same rate, how much water would have disappeared during this time from a surface as large as the schoolroom floor? From an acre? From a square mile? Problems of this kind can be used with pupils in the higher classes in city and town schools, and with older pupils in rural schools.

What hastens evaporation? What tends to prevent it? Do you think evaporation is equally rapid over all parts of the earth? Why? What is your idea of the quantity of water daily taken into the atmosphere by evaporation? From what source is most of this water taken?

Humidity is the term used to indicate the amount of water vapor in the atmosphere compared with the amount which it can contain. This amount depends upon temperature. The amount that would make cool air damp would not be noticeable in warm air. When the air contains all it can hold, it is said to be saturated.

41. The Dew-Point. Pour into a tin vessel some cold water. Wipe the outer surface of the vessel so that it is perfectly dry. How do you account for the moisture which soon gathers upon it? After the pupils understand the reason for the gathering of the moisture, perform another experiment. Partially fill the dish with water of the same temperature as the room. Stand the thermometer in the water, then sprinkle in slowly crushed ice or snow, watching carefully for the appearance of moisture on the outside of the dish. Note the temperature at which this begins to form. This indicates the temperature at which the atmosphere becomes saturated and begins to deposit its moisture. This temperature is known as the *dew-point*. How is dew formed?

Why is there more on some nights than on others? Why does it gather in larger quantities on some objects than on others? Of what use is dew to vegetation?

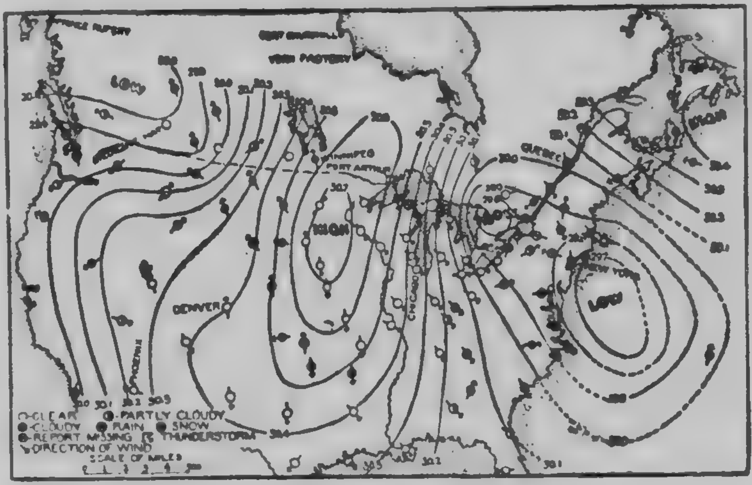
42. Clouds. When you breathe into a cold atmosphere what do you see? Ask the pupils to observe the steam issuing from the spout of the tea-kettle. Why is it invisible just at the mouth of the spout? What makes it visible a short distance from the spout? What is fog? What are clouds? Does fog ever change to clouds? Under what conditions do fogs and clouds form? What winds produce cloudy weather? Why? What winds produce clear skies? Why?

The answers to these questions will require observations extending over considerable time, and it is quite probable that you will need to assist the pupils by other questions or by explanations in finding the cause for fogs and clouds. In connection with these explanations, remember the influence of dust in the atmosphere upon the formation of clouds. Particles of dust attract water vapor and assist in its condensation; therefore, dust is an important agency in cloud formation.

43. Rainfall. When the temperature of the atmosphere falls below the point of saturation, a part of its moisture is precipitated as rain or snow. Have the pupils observe the conditions which cause storms, until they understand how rain is produced. You may not be able to explain satisfactorily peculiar local conditions, if they exist, but you should be able to explain how mountain ranges located like the Rocky Mountains affect the rainfall of the regions upon each side of them, how local showers are caused and why some winds bring rains and others fair weather.

44. Weather Bureau. Through the weather bureau the national government comes in contact with nearly all of the people, and it is of practical advantage to everyone to be able to read the weather maps and to understand the meaning of the signals displayed at weather observatories and in many other places. Before you can give lessons upon this subject you will need to understand the barometer and be able to read the weather maps and signals yourself. If not familiar with these, consult a physical geography or an elementary meteorology. Study the weather map printed here and answer the following questions:

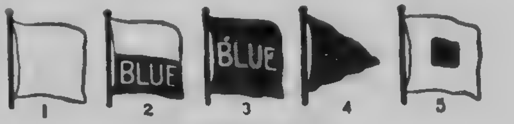
What do the heavy full lines represent? What do the numbers at the end of these lines indicate? What do the heavy dotted lines represent? What is meant by the words high and low? In what places did thunder storms occur on that day? In what places did clear weather prevail? In what localities was the sky partially overcast with clouds?



WEATHER MAP

Weather maps can be procured from the nearest weather observatory, and frequently from someone who receives them regularly from the bureau. They are usually displayed in postoffices and often in other public places. With the maps in the hands of the pupils, conduct exercises similar to those indicated above. An occasional exercise of this nature will enable the pupils to read these maps without difficulty.

Study the weather signals as given in the following figures. You can often interest the school in this work by having the older pupils prepare a set of signal flags. The girls can make the flags, and the boys can procure and mount the flagstaff. Then run up the flags each day to represent the forecast obtained from the weather bureau. These forecasts are sent to all postoffices and it is seldom that a school is so situated that they cannot be obtained daily. For the making of desirable flags, the following material will be needed: Five yards of white muslin, five yards of blue and two yards of black calico. Obtain unprinted calico. This material will make a set of flags one yard square for the full flags and triangles one yard long for the half-flags. If flags a half-yard square are desired, only one-fourth this quantity of material will be needed. Drill the pupils on the use of the flags until they can give the meaning of each combination at sight. Have the pupils compare the forcasts with their daily record as explained on page 62, and determine what proportion of the forcasts are correct.



WEATHER FLAGS

1—White: fair weather 2—White and blue: local rain or snow. 3—Blue: general rain or snow. 4—Blue triangle: change of temperature; when above another flag, warmer; when below, colder. 5—White with black center: cold wave.

45. Aids. At the end of each division of the lesson on Elementary Science, books pertaining particularly to that division have been mentioned. Those given here are of a more general nature. It is assumed that every teacher has good text-books on physics, botany, zoology and physical geography.

Nature Study and Life. Hodge. 514 pages. Ginn & Co. This is the most helpful book on science lessons to be obtained. The text is clear and practical, and the illustrations are of great value.

The Study of Nature. Schmucker. J. B. Lippincott & Co. A plain, practical and helpful book. The work described is within the reach of all teachers and pupils.

Special Methods in Elementary Science. C. A. McMurry. 275 pages. Macmillan Company. This is a very helpful work in planning a series of lessons and preparing type studies. The bibliography is valuable.

Elementary Physics. Gifford. Teachers' edition. Thompson, Brown & Co. This little book contains many suggestions for experiments that can be performed with home-made apparatus.

WORK BY GRADES

46. Suggestion. The subjects treated in this lesson and the one preceding, together with the following outlines, indicate what may be done in each grade. These illustrative lessons and outlines are sufficient to give the teacher a working plan for any other branches of science which she wishes to introduce. The work in physiology is so closely associated with the work in school hygiene that it is explained in connection with that topic in Volume One, on *Hygiene.* In most schools, lessons on common minerals and on some chemical changes, such as combustion, fermentation and the action of acids upon alkalies, should be given.

Botany

47. Fourth Year. The botany work in the fourth year presupposes the mastery of the lessons in nature study in the previous grades. In the fourth grade attention should be given to the following:

(1) Study of small fruits, berry, squash, apple, plum.

(2) Planting and germination of seeds in window gardens or school garden.

(3) Raising flowers and vegetables.

(4) Study of simple spring flowers.

(5) Care of the garden through the summer. See the lesson which follows, Sections 3 to 6.

(6) Recognition of common trees by their bark, branches and leaves.

48. Fifth Year. The work of the fifth year covers some of the same ground as that in the fourth, but the study extends further and includes more complex subjects:

(1) Compound fruits; raspberry, blackberry, capsule.

(2) Collection of seeds for planting in the spring.

(3) Branching of trees.
(4) Study of the simplest fall wild flowers.
(5) Life history of a simple plant, as a violet or morning glory. See pages 6-18, *Study of Corn.*
(6) Raising flowers and vegetables in the garden.
(7) Study of buds and leaves.

49. Sixth Year. Pupils of the sixth year can study successfully the more minute parts of the plant:

(1) Dandelion, sunflower, asters.
(2) Methods of seed dispersal.
(3) Weeds. See pages 84-88, *Study of Weeds*
(4) Coloring of autumn leaves.
(5) Recognition of woods by their structure and appearance.
(6) Work on the garden continued. Competitive raising of flowers and vegetables.
(7) Spring flowers not previously studied.
(8) Poisonous plants.

50. Seventh Year. The botany work of this year should place emphasis upon the economic features of this subject and the protection of plants during the winter:

(1) Composite flowers, sunflower, goldenrod, asters.
(2) Special study of one tree as a type.
(3) Competitive gardening, raising flowers and vegetables.
(4) Life history of an economic plant, such as wheat, corn or cotton. See pages 6-18, *Study of Corn.*
(5) Flowerless plants, mushrooms, mosses, ferns. Pages 93-94, Section 27.

51. Eighth Year. In the eighth year the work of the previous grades should be summed up:

(1) Classification of fruits.
(2) Characteristics of the most common Orders of plants and the leading flowers belonging to each.
(3) Plant physiology.
(4) Competitive gardening. Page 78, Section 6.
(5) Preservation of forests.

52. Ninth Year. The botany work of this year will include the study of the subject from a text-book and the plan of the book should be followed.

Zoology

53. Fourth Year. The work in zoology in the fourth year is a part of the nature study lessons and is carried on entirely by observation:

(1) Study the dog.

(2) Ducks and geese.

(3) The care of poultry.

(4) Common insects, such as the fly, bee and wasp. See pages 40-50, Sections 3-24.

(5) Rats and mice, and the best means of exterminating them

(6) Common songbirds. Pages 20-36, Sections 23-41.

54. Fifth Year. The work of the fifth year should enter somewhat more into detail than that of the fourth, and should include the study of animals and birds as types of the different Orders which they represent:

(1) Study the squirrel or rabbit as a type of the gnawing animals (rodents).

(2) The horse, the turtle, the muskrat and the salamander can be studied in a similar manner.

(3) Insects of the garden, giving special attention to those which are destructive, such as the cabbage worm and the currant worm. Pages 98-102, *Destructive Insects.*

(4) Clams, crawfishes, snails.

(5) Common birds, giving special attention to birds that feed upon destructive insects. Pages 20-36, *The Study of Birds*, Sections 23-42.

55. Sixth Year. In this year it is well to give some attention to zoology during the winter months:

(1) Study the feeding and care of livestock.

(2) Birds that spend the winter in your locality. Pages 20-36, *The Study of Birds.*

(3) The state laws for the protection of birds.

(4) Noxious insects, including those which are specially destructive to certain crops, such as the codling moth, chinchbug and Hessian fly. Pages 98-102, Sections 34-39.

(5) The earthworm, the mole, ants, spiders.

(6) Fishes common in the ponds and streams of your locality. In connection with this, call attention to the laws for protecting fish.

56. Seventh Year. The work of the seventh year should emphasize the economic feature of zoology, showing the value derived from certain animals and birds and the injury caused by others:

(1) Life history of the toad. Same plan as adopted for study of the mosquito, Sections 15-2

(2) Life history of the cat as a type of flesh-eating animals.

(3) Insects continued, taking up those that have not previously been considered, but are of such importance as to warrant devoting time to them

(4) Continue the study of fishes. By use of reference works this can be continued to salt-water fishes; the important food fishes should be considered

(5) Bird study continued, giving special attention to the English sparrow and other birds which destroy crops. Pages 20-36, *The Study of Birds*, Sections 23-42.

57. Eighth Year. In the studies of the eighth year all previous work should be summarized and unified:

(1) The study of the ox as a type of cud-chewing animals.

(2) The study of animals which destroy noxious insects and animals, as the bat, the porcupine and the weasel.

(3) Insect pests from an economic point of view. Pages 98, 99, 103, Sections 34, 35, 41.

(4) Game birds and bird laws. Also continue the study of song birds in accordance with the plan in pages 20-36, *The Study of Birds*

(5) Frogs and salamanders.

(6) The chief characteristics of the leading Orders of animals, such as the rodents, the carnivorous animals and the hoofed animals, especially the ox tribe. The extent to which this work can be carried will depend upon the strength of the class and the time that can be devoted to it.

58. Ninth Year. This year should continue the work outlined for the eighth year or pursue the subject by the use of an elementary text-book. In the latter case, the plan of the book should be followed.

Physics

59. Fourth Year. The work in physics which can be attempted in the fourth year will depend in a measure upon what has been discussed in the nature study lessons of the previous year. The work should be very simple and should consist chiefly in calling attention to the principles involved in numerous acts of everyday life. In the outline here given, the term *physics* is used in its broadest application, and some of the lessons suggested are closely related to chemistry:

(1) Water in its various forms and uses, as water, ice, snow, frost, vapor, steam.

(2) A few common tools, as the crowbar, the hammer and the hatchet or ax.

60. Fifth Year. Continue the work of the fourth year:

(1) The study of common implements about the home and school, as stove, lamp, furnace, egg-beater and meat-cutter.

(2) The study of ventilation; ventilation of sleeping rooms, the schoolroom, churches and public halls. Show the injurious effect of impure air.

(3) The formation of dew, fog and clouds.

61. Sixth Year. Some of the lessons in this year involve the principles of chemistry:

(1) Combustion, including the different kinds of fuel with which the pupils are acquainted.

(2) The action of soap and other similar preparations in cleansing. The ingredients in soap, and how it is made.

(3) Heat. How heat is produced; how it travels; conductors and non-conductors. The thermometer; construction and use.

62. Seventh Year. The pupils in this year should apply their knowledge of arithmetic to simple problems in physics:

(1) The mechanical powers (Sections 26-30).

(2) Pressure of the atmosphere; the siphon; the lifting pump (Section 33); the force pump.

(3) Sound; how it is produced; how it travels. Principles of the musical scale; musical instruments.

63. Eighth Year. The work of the eighth year can be somewhat more advanced but should be closely related to that of the seventh:

(1) Light. Sources of light; how it travels; reflection and mirrors; refraction; lenses; some optical instruments; camera; opera glass, microscope.

(2) Electricity; some of the ways electricity is produced; the electric current; conductors and non-conductors; electricity and magnetism; the dynamo, the electric motor, and some of the uses of electricity.

(3) Study of the atmosphere in its relation to the weather (Sections 38-43).

TEST QUESTIONS

1. Would the dragon fly answer the purpose as well as the grasshopper for studying the parts of an insect? If so, can you see any difficulty attending its use?

2. Besides a knowledge of insect life, what should the pupils gain through such studies as those of the grasshopper and the mosquito?

3. Name ten insects which pupils can study with profit after the plans given in their lesson.

4. To what Order does each of the following insects belong: katydid, potato bug, ladybird, cabbage butterfly, bumblebee, ant, the insect that produces the currant worm?

5. Present a plan for the study of the squirrel or some other animal common to your locality.

6. Why should pupils of grammar grades study the elementary principles of physics?

7. What is a machine? Can a machine create power? Why? Of what advantage are machines?

8. Describe the lever as illustrated in common shears, naming the parts and showing what constitute the power and the load respectively.

9. Why does warm air rise? Why does an upward current of warm air cause the formation of clouds?

10. Explain how you would use a weather map with a class of seventh or eighth year pupils, and what would you teach from it?

CHAPTER THREE

ELEMENTARY AGRICULTURE

1. Value. Agriculture is the most widely extended and the most important industry of our country. The nation's prosperity depends upon that of the farmer, and whatever improves agriculture benefits all other industries. Recent years have been characterized by the application of scientific methods to all branches of industry. Processes of manufacture have been cheapened, new resources have been discovered, and national prosperity has been advanced.

If agriculture is to compete with our other great industries, it must rest upon an equally scientific foundation. The Dominion Department of Agriculture, the faculties of agricultural colleges and experiment stations, other leading educators, and influential farmers all recognize this fact, and within the last few years there has arisen an almost universal demand for teaching the elements of agriculture in the public schools. The branch is now required or strongly recommended in the course of study in nearly every state.

The introduction of agriculture gives definiteness to the work in nature study in the lower grades and furnishes a goal towards which many of the lessons in elementary science in the intermediate and higher grades should trend. Agriculture is also closely related to geography and more or less closely associated with all other branches in the course of study. Moreover, lessons in agriculture furnish a new line of work for the older boys and girls of the rural districts and often induce them to remain in school for another term.

2. Plan. The exercises which follow are such as can be used in any school where material can be obtained, regardless of the locality. They are likewise typical of many other exercises that can be given by any teacher who is interested in the subject and is willing to inform herself upon it. The lessons should be selected with reference to the season, so that as far as possible they may treat of the work which is being done on the farm. It is not necessary that the exercises be given in the order in which they occur in the lesson.

THE SCHOOL GARDEN

3. Utility. The school garden furnishes the best means for teaching and illustrating the principles of agriculture, and every school which does not already have one should try to secure a garden. The garden furnishes a centre of interest and activity for all the pupils and also affords the best opportunities for connecting the work of the school with that of the home.

4. Arrangement. The arrangement of the school garden depends so much upon the size and shape of the grounds available that each teacher will have to make her own plans. The following suggestions are to serve merely as guides, and they do not apply to the schoolgrounds. That subject is treated in Volume One, page 29, Section 25.

(1) In laying out the garden, give due consideration to the schoolgrounds. The playground should not be sacrificed.

(2) A great deal can be accomplished on a small patch of ground, if it is properly utilized.

(3) If the schoolgrounds are small and additional space cannot be leased, make use of narrow strips along the fence and around the schoolhouse.

(4) If space will permit, have one or two experimental plots, which should be under your direction and for the use of the whole school.

(5) Reserve a plot which the younger pupils, including those of the first three grades, can use together.

(6) Apportion the remaining ground to the older pupils, so that each one will have a plot.

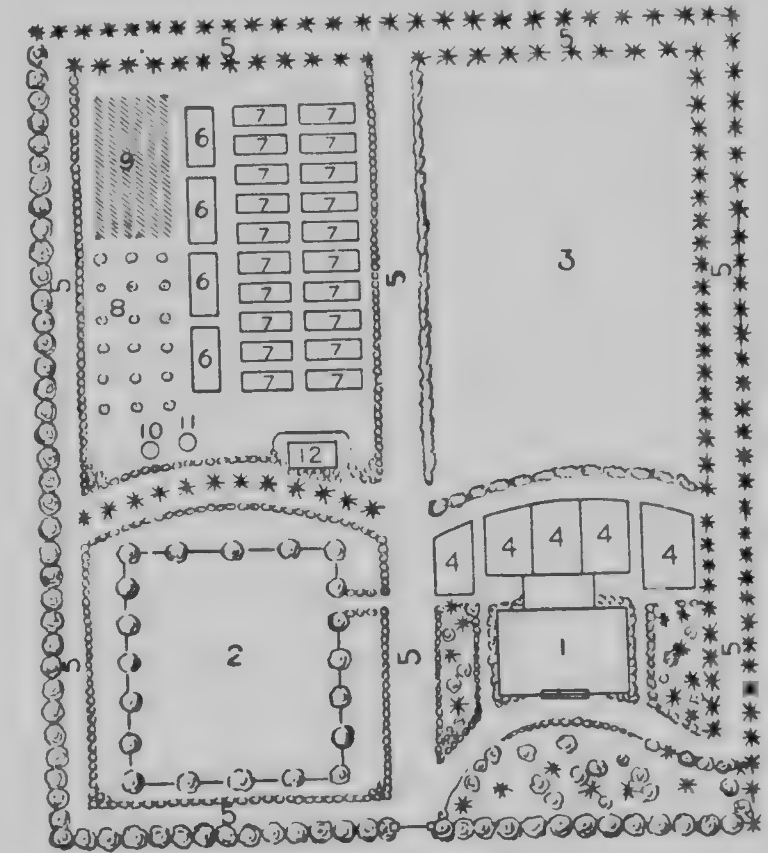
(7) Hold each pupil responsible for the planting and care of his plot through the season.

(8) Have everything done about the garden in a systematic and orderly manner. The plots should be well cared

for, the walks kept free from weeds, and all tools should be kept in their proper place when not in use.

(9) Make these plans with the pupils and have them agree to abide by whatever decisions are reached.

(10) Plant common things. The common flowers, garden vegetables and farm crops should receive attention rather than rare plants which may be regarded as curiosities.

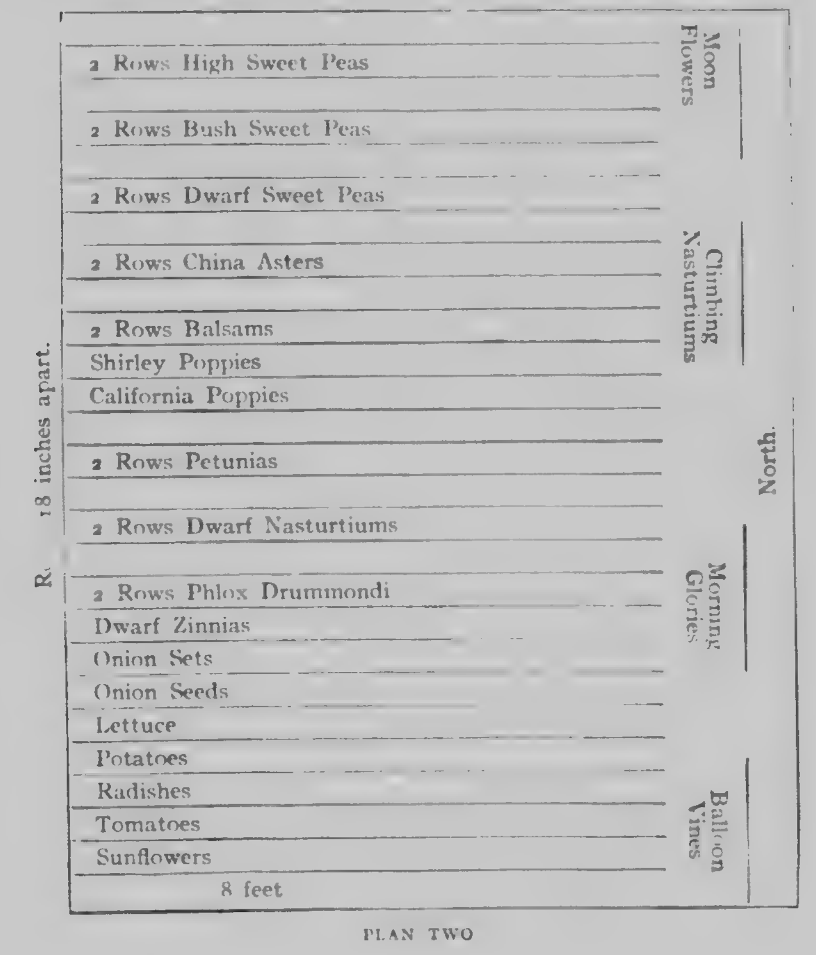


PLAN ONE

1, school; 2, girls' lawn; 3, boys' campus; 4, experimental plots, 5, avenues and walks [illegible] experimental plots; 7, pupils' plots; 8, orchard; 9, forestry plot; 10, well; 11, tank; 12, garden shed.

While as far as possible each pupil should be allowed to decide for himself what he will plant in his plot, due regard should be given to variety.

(11) If you have a large garden, the rows should run east and west or north and south. The latter arrangement is better, because it admits the sun between the rows at all hours in the day. If, however, it is necessary to run the rows east and west, corn, pole beans and other plants which



PLAN TWO

have tall stems should be planted on the north side, so they will not cast a shadow upon smaller plants.

(12) The plan of the garden will depend to a great extent upon the size and shape of the schoolgrounds.

Plan One, page 75, is that of the Macdonald schoolgrounds, Bowesville, Ontario. It is ideal, but it requires large grounds.

Plan Two, page 76, is recommended by Prof. Blair, of the University of Illinois, for a garden 40 feet long and 10 feet wide.

5. Uses. The uses here emphasized are especially related to the work in elementary agriculture; but the teacher should not infer that they are the only purposes which the garden can serve. It should be regarded as the experimental farm of the school. On each individual plot the pupil is investigating on his own responsibility, and on the experimental plots ideas are worked out by the school as a community, under the guidance of the teacher.

(a) GERMINATION. The garden enables the pupils to study the different plans of germination and growth represented by the various plants tilled in the garden and the field.

(b) TILLAGE. In the garden all the principles of tillage may be applied and their effects studied.

(c) VALUE OF FERTILIZERS. By treating some experimental plots with one kind of fertilizer and others with another, comparative merits can be ascertained, and by leaving one plot without fertilizers their value can be shown.

(d) WEEDS. If the pupils keep their plots free from weeds, they will realize how rapidly these plants grow and spread and the importance of finding the best means of prevention and destruction.

(e) SOIL WATER. What constitutes a proper amount of moisture in the soil is a problem requiring for its solution most careful observation, and in the school garden the effect of moisture can be studied daily.

(f) SOIL. A knowledge of the structure and composition of soil is necessary to successful agriculture, and with the garden for an object lesson the class can be taught how to study soils.

(g) INSECTS. The insects which attack farm crops are sure to prey on the same plants in the school garden, and the pupils can here observe their habits of life and note the effect of various insecticides used in their destruction.

6. The Home Garden. Nearly all the exercises found in this lesson can be worked out by using the school garden, but the pupils should also make observations in the home garden and in the fields and compare results. If the school does not have a garden, each pupil should have a small plot of ground at home and do his work there. He should keep a record of his work and observations, and these records should form the basis of a school exercise once a week. Occasionally these exercises should be supplemented by excursions.

THE SOIL

7. Composition. Upon questioning the pupils you will probably learn that most, if not all of them, regard the soil as dirt. Ask several to bring flower pots filled with soil from their respective gardens. Protect a window sill from moisture on the sunny side of the room by placing a board upon it or by setting the pots in plates and placing them in the window. Dry a small quantity of soil from one of the pots and spread it very thinly on a sheet of white paper and examine it with the strongest magnifying glass you have. Are the particles all alike? How many different sorts can you find? How do you account for the difference?

Take a cupful of the soil, weigh it in the balance described on page 52, in Section 27. Dry it thoroughly and weigh it again. How do you account for the loss in weight? Now place this soil on an old shovel or a piece of sheet iron; put this in the fire and let it remain until the iron becomes red-hot. Does the soil burn? Allow the soil to cool; then weigh it again. Has it lost weight a second time? How has the soil changed in appearance as the result of heating? Why? How do you account for what you discover? The organic matter has been burned out, lightening the color, or the color may be redder.

Soil is composed of mineral matter, and decaying animal and vegetable matter known as *humus*. When heated to redness the humus will burn. Its destruction by fire of course removes some matter, so the soil on the third weighing should be lighter than on the second.

8. Life in the Soil. Have the pupils examine the soil in each pot for insects and other animals. How many different species are found? Keep the soil moist in one or two of the pots and leave it undisturbed. Have the pupils watch the plants that appear. How many different kinds are there? This question cannot be answered until the plants have grown a week or more. When was the seed from which these plants spring placed in the soil? How was it done?

9. Kinds of Soil. Have the pupils bring specimens of soil from different localities. Compare these as to color and material. Examine a portion of each specimen with the magnifying glass. In what respects do they differ? How deep was the soil where each specimen was found? This question can be answered by having each pupil make a V-shaped excavation having one side vertical and extending down into the earth as far as the layer of soil and then measuring the soil on the vertical side of the cut. The direction for doing this should be given at the time the pupils are asked to secure the soil; otherwise, an extra trip to the locality will be necessary.

The kind of soil is determined by its composition or structure. A sandy soil is one that is nearly three-fourths sand. A clayey soil contains over one-half clay. A limy soil is one that contains over one-fifth lime. A peaty or vegetable soil is composed almost entirely of decaying vegetable matter, or humus. A loam is a soil containing a mixture of sand, clay and humus. A perfect soil contains these various ingredients in perfect proportions. It has enough sand to enable it to absorb the necessary quantities of air and moisture, enough clay to prevent too rapid leaching or evaporation, sufficient loam to aid in the decay of vegetable matter, and enough humus to enable it to retain the proper amount of moisture and to furnish the necessary material for maintaining the fertility.

A clayey soil is liable to be lumpy and hard, while a sandy soil is loose and friable. A heavy soil is one containing a large amount of water and not easily broken up. A light soil is one having a fine texture and is easily worked. Loams containing a sufficient quantity of humus are the most desirable soils.

10. Soil Water. Dip a marble in water and withdraw it. Is the water evenly distributed over its surface? How much water adheres to the marble? (Only enough to form a very thin film over the surface.)

If the marble were crushed to a fine powder, would more water adhere to the powder than to the marble in its present state? Take a quantity of fine sand as nearly equal in bulk to the marble as you can estimate. Dry thoroughly and place it in a small glass or cup. Add water drop by drop until all the grains of sand are covered with a film of moisture. How many drops were required? How many drops would be necessary to cover the marble? (Less than one.) How do you account for the difference? (The entire surface of all the grains of sand is much greater than the entire surface of the marble; consequently, it requires more water to cover all with a film of moisture.)

By these experiments lead the pupils to understand that the soil water used by plants is in the form of *film moisture*, that this water dissolves the plant food in the soil and enables the plants to absorb it through its roots. *Free water* is water in excess of film moisture, and when present it gathers in excavations when they are made. The height to which free water rises in the ground is called the *water table*.

Before the exercises on this topic are concluded the pupils should understand that the right amount of moisture is necessary to the most successful growth of plants. Too much moisture or free water drowns the roots, and when free water is present the land should be drained. When there is too little moisture, the plant is not only deprived of the necessary amount of food which the water dissolves from the soil, but what is probably more important, it is deprived of a portion of the nourishment provided by the water itself. All plants contain more or less starch and sugar, and water enters largely into the composition of these substances.

11. Other Exercises. The foregoing exercises are typical of numerous others that can be given on soil. The following are important and should receive attention as time permits: tillage, fertilizers, and the formation of soils.

SELECTING SEED

12. Importance of Good Seed. Corn, wheat, oats, rye barley, rice, cotton and numerous other crops of less importance are all reproduced from seed. These crops constitute the bulk of our farm products, and the quantity of seed planted in the United States each year amounts to several million bushels. The selection of seed is a work of far-reaching influence, and every farmer should have all the information he can obtain on this subject. The principles and methods of selection can easily be taught to the oldest pupils, and the exercises are of interest because they introduce something entirely new.

13. Cereals. Because of their extent and value, the great grain crops demand first attention. Cereals "come true from the seed;" that is, the seed produces a plant like the one from which it came. If you plant a seed from a certain variety of wheat or corn, the same variety of wheat or corn will be produced. Not only does seed reproduce the variety; it also has a tendency to reproduce a plant with the same characteristics as the parent. Seeds from plants that are good bearers produce plants that bear well. Seeds from large, vigorous plants tend to produce large, vigorous plants, and so on.

In selecting his seed the farmer should be guided by certain principles, among which the following are important:

(1) Seed should be selected from the most perfect plants. The plant should be (a) strong and vigorous, (b) a good bearer, (c) able to resist drought, (d) able to resist plant diseases.

(2) Seed should be selected before the harvest. The farmer should go through his field and select the most perfect plants from which to take his seed, and should harvest these first.

(3) Repeated selection is necessary. If the farmer wishes to improve his crop he must select his seed year after year. For illustration: A farmer wishing to improve his wheat would on the first season go through the field and select enough of the best plants to give him sufficient seed to plant a small plot the following season. The seed from this plot should be used the second year for his crop, but before the wheat on the plot is harvested the most perfect plants should again be selected to furnish seed for a like plot the following season. By continuing this method from year to year, the variety of wheat will be decidedly improved, and it is in this way that many of the best varieties of wheat, corn and other grains are secured.

14. Characteristics of Good Seed. In order to select good seed one must know its characteristics, which are as follows:

(1) It is plump. With the exception of some varieties of peas, sweet corn and onions whose seeds are wrinkled, the seed should be well filled and smooth.

(2) It is of good color and luster. Good seed has a bright, clear color, appropriate to the sort to which it belongs, and it usually has a shiny appearance. If it lacks this appearance it was probably packed in bulk before being thoroughly dried and may have heated so as to kill the germ.

(3) It is new. Whenever possible, the seeds that have been raised the previous season should be selected, since the proportion of seeds which grow diminishes with age.

(4) It should be pure; that is, it should be free from dirt and from the seeds of other plants, especially weeds. The seeds of certain weeds resemble those of some cultivated

plants so closely that seed can frequently be adulterated without detection, unless the purchaser uses great care. When adulteration is suspected, a small quantity of the seed should be spread upon a white surface and examined with a magnifying glass.

As the different grains ripen, encourage the pupils to make selection of seed from the prevailing crops in your locality, and after the plan given in these exercises. Each pupil should keep his seed and plant it the next season. Then, in the following autumn, compare results which he obtained with those of similar crops raised from seed selected in the usual manner.

The wheat crop of the Dominion averages over 236,000,000 bushels. If by careful selection of seed this crop should be increased 25 per cent and wheat were worth 75 cents a bushel, how much would be added to the annual income of the farmers from this crop alone? Apply the same proposition to the oat crop, whose average is about 360,000,000 bushels. Does it pay to use time and care in the selection of seed?

15. Other Crops. Potatoes and many varieties of fruit are reproduced from cuttings. These plants will not reproduce exactly from the seed. The same principles should guide and the same care should be exercised in selecting the so-called seed, that is, the potatoes and cuttings which are to be planted for these crops, as are exercised in selecting seed for cereal crops.

16. Testing Seeds. Seed may have all of the external appearances of perfection and still be undesirable. One should know that it has strong vitality, that is, that nearly all of the seeds planted will grow. In localities having cold winters, the vitality of seed is often weakened by freezing. In such regions all seed designed for planting should be thoroughly dried before cold weather sets in and then kept in a dry place through the winter.

Teach the pupils how to test seeds for vitality. To do this, procure a number of plates or shallow tin dishes and some sheets of blotting paper or pieces of flannel. Rectangular dishes are more convenient because they are readily divided into sections of equal size. Fit a piece of blotting paper or flannel to the bottom of each dish, then mark this off into possibly ten sections of equal size. If, to illustrate, you wish to test seed corn, take ten ears of corn, numbering them consecutively from 1 to 10. Number the sections in the pan in the same manner. Take ten seeds from each ear Place these in the sections so that those from ear 1 will be in section 1, from ear 5 in section 5, and so on. Moisten the blotting paper or pieces of flannel and keep the seeds between them, covering the pan or plate with another dish so as to exclude the light. Keep the dishes in a temperature of from 70 to 75 degrees until the seeds sprout. Count the number of seeds that have sprouted. If nine seeds from ear 1 germinate and only five from ear 2, it is reasonable to suppose that nine-tenths of the kernels planted from the first ear will grow and only half of those from the second ear. These tests can be made in the winter or early spring, provided the schoolroom is warm over night. The tests should be made before the time for planting in the spring. Encourage the pupils to test seed which has been selected for the various crops of the farm and note results.

Some of the most valuable work which has been done by the experiment stations in the Dominion has been in showing farmers how to test and to perfect their seed. The care shown in the selection of seed has increased the value of agricultural products by millions of dollars, and has enabled Canadian farmers to grow the finest wheat and oats in any part of the world.

WEEDS

17. What Weeds Are. The term *weed* is used somewhat loosely, but it generally means a plant which is unsightly or injurious to other plants among which it grows; so applied, grass or oats growing in a corn field would be weeds. However, our present application of the term is restricted to those plants that serve no useful purpose and that propagate themselves with great rapidity. Weeds shade the crops, deprive useful plants of their nourishment and rob them of a large amount of their moisture. The loss to crops in the Dominion by weeds amounts to several million dollars each year.

18. Classes of Weeds. How many weeds can the class recognize and name? It is a good plan to make a study of the weeds most troublesome in the locality, according to the plan for the study of corn. (See pages 6–19, *The Study of Corn.*) This study will disclose the fact that some weeds live only one year (annuals), some live two years (biennials), and some live more than two years (perennials). Each class needs special treatment.

The weeds which are so troublesome as to receive special notice by the Dominion Department of Agriculture are the Russian thistle, prickly lettuce, bracted plaintain, horse nettle, buffalo bur, spiny amaranth, dagger cocklebur, chondrilla, wild carrot, wild oat, false flax and Canada thistle. Most of these are quite generally distributed over the country. However, you may have in your immediate vicinity others which, though confined to a smaller area, are equally troublesome.

19. Points to be Observed. In studying the life history of a weed, it is necessary to learn its habits of growth and propagation, the localities and crops which seem most favorable to it, and whether or not it has any insect or animal enemies. When these facts are determined, the most effective means for the prevention or destruction of the weed can be found.

Most weeds, and especially annuals, produce a large number of seeds, ranging from two thousand to eight thousand to the plant. The seeds are usually of strong vitality, and the plant has some means by which they may be widely scattered. The agencies through which these seeds are dispersed are the plant itself, the wind, birds and other animals. The seed vessels of some of these plants burst with considerable force, scattering the seed for several feet in all directions, but many annuals have stems with numerous branches, and when uprooted in the fall they are so nearly round that the wind blows them about readily and they scatter seeds wherever they go. Weeds taking this form are generally known as tumbleweeds, and the name is applied to several different species. Ask the pupils to find what plants produce seeds with burs or hooks so they can attach themselves to animals. Doubtless they are all familiar with tickseed and burdock, but they may never have thought of the purpose served by the seeds in sticking on to whatever comes in contact with them. Ask the class to find tumbleweeds, also to notice how the seeds of the thistle, milkweed and the prickly lettuce are scattered.

PRICKLY LETTUCE

Why do weeds grow so profusely along fences and by the sides of roads? The answer to this question will lead pupils to see that birds perching on the fences frequently drop seeds which take root and grow.

Another way in which weeds are scattered is by their seeds being mixed with the seed planted for the crop. In this way the Russian thistle and others of the most injurious weeds in the country were introduced from Europe. The seeds of some of these weeds resemble the true seed so closely, as in case of clover and grass, that one must be an expert to determine whether or not such seed is adulterated. If in doubt, a small quantity of the seed should be spread upon a white surface and examined with a magnifying glass. This will bring out the difference in form and color, and whenever seed is suspected of adulteration, a very careful test should be made before planting.

Have the pupils gather the seeds of these different weeds as they mature and study them until they are able to recognize them wherever met.

The root of the weed should also be studied. Is it fibrous or fleshy? Can you tell from the root whether the plant will live one year, or longer?

20. Destruction of Weeds. The habits of the plant being known, the pupils should have their attention called to the most effective methods of their extermination and prevention. Since annuals die down to the ground at the end of the season, they can be exterminated by preventing them from seeding. Cultivation early in the season is, therefore, much more effective than at any other time. It must be remembered, however, that not all of the seeds of an annual germinate the first year. Some may remain in the ground for two or even three years, and however carefully the plot infested with such weeds may be tilled the first season, the farmer may expect a crop of the same weeds the second season, although it will not be so large, and possibly a few others will be found the third season; but by persistent cultivation from year to year, the weeds will be destroyed.

The first year biennials store their nourishment in the root, which enables the plant to develop very rapidly and produce a large number of seeds the second year. These plants can be killed by cutting off the root a few inches below the surface of the ground. This same method also applies to many perennials, though these weeds are more difficult to kill than those of either of the other classes. A spud, which is a chisel attached to a fork handle, is the most effective implement for this purpose. Where a plot is badly infested with perennial weeds like the Canada thistle, it is a good plan to plow the land, then rake together as many of the roots as possible, and when they are dry, burn them. This will not eradicate all of the weeds, but it will destroy a large number; and by following the plan at each plowing, in the course of two or three seasons the most of these weeds will be destroyed.

A SPUD USED FOR CUTTING WEEDS

The sources from which most weeds spring are untilled land, such as old pastures and the narrow strips along fences and roadsides in which the weeds mature and scatter their seed. However carefully one farmer may till his land and eradicate weeds from such places, he can never wholly free his land unless his neighbors are equally particular, for the seeds from most of these pernicious plants travel long distances. This point should be fully impressed upon the class in connection with this study. United action is essential to ridding any locality of noxious plants, destructive insects and plant diseases.

CANADA THISTLE

The Department of Agriculture of the United States, of the Dominion and of your own province will gladly furnish information on weeds and how to kill them.

ROTATION OF CROPS

21. Plant Foods. The most important plant foods furnished by the soil are nitrogen, potash and phosphoric acid. When any one of these foods is exhausted, good crops cannot be obtained. Plant food can be restored to the soil by tillage, by fertilizers and by growing certain crops which are plowed under. The most favorable crops for this purpose are cowpeas and the various clovers, because they all extract nitrogen from the air and store it in their roots. When the roots decay the nitrogen is given to the soil and can be used by other plants as food.

22. Observations. What are the prevailing crops in your locality? Do the farmers generally raise a crop of the same kind on the same land year after year? If so, how does the yield of each succeeding crop compare with that of the previous season? How does the present yield compare with the yields eight or ten years ago? (Have pupils ascertain this fact from farmers who have resided in the neighborhood for a long time.)

Do any farmers raise different crops from the same piece of land in successive seasons? If so, how does the yield of their crops compare with the yield of the same kind of crop on farms where this practice is not observed? If there is any marked difference, ask the pupils how they can account for it.

How does the change of crops affect the growth of weeds? Why are the crops in those fields where they are not frequently changed more liable than the others to be attacked by smut, rust or other diseases? Are they more frequently attacked by destructive insects? The answers to these questions will require examination of the fields at frequent intervals through the season. If rotation of crops is not generally practiced, but is practiced by a few farmers, the contrast will probably be quite noticeable; other conditions being equal, the results will be in favor of the farmer who practices rotation.

23. Reasons for Rotation. Rotation of crops is beneficial to the soil and profitable to the farmer for the following reasons:

(a) IT PREVENTS EXHAUSTING THE SOIL. No two plants extract in the same proportions the same kind of food from the soil. For illustration, corn requires nearly three times as much nitrogen as oats and twice as much as wheat, while hay requires more nitrogen than oats but only about one-half as much phosphoric acid. By change of crops the different foods are used in such a way as to prevent any one from being exhausted. Again, some crops have shallow roots and feed from the layer of soil near the surface. This is true of most annuals. Others, especially the root crops, are deep feeders and extract a large part of their nourishment from the deeper layers of soil. Thus, by alternating shallow with deep-feeding crops, the plant food from all of the soil is more evenly utilized.

(b) SUPPRESSION OF WEEDS. Some weeds seem to have a peculiar affinity for certain crops and are found mixed with them or bordering the field. If this crop is planted on the same ground for several seasons in succession, the weeds gain such a hold that it is very difficult to eradicate them. Again, some crops, like wheat and oats, prevent tillage. If these are followed frequently by such crops as corn or potatoes, which admit of tillage through the season, most of the weeds are destroyed.

(c) THE PREVENTION OF INSECT PESTS. Every plant has its own insect enemies, such as the wheat weevil and the chinch bug, the former feeding upon the wheat and the latter upon both wheat and corn. If the crops are continued from year to year, the ground becomes infested with the eggs and cocoons of these insects to such an extent that they become very destructive; but if the crops are changed each season most of the insects perish because their food is taken away.

(d) PREVENTION OF PLANT DISEASES. What we have said about insects is equally true of such diseases as rust and smut on corn and blight and rot on potatoes. While some of these diseases may appear on plants which are nearly related, most of them are confined to the particular plant on which they are found, and by changing crops each season they are unable to obtain a hold which enables them to do any great damage.

(e) CERTAINTY OF INCOME. A rotation and variety of crops usually assure the farmer of an income each season

If one crop fails, another usually succeeds. While doubtless he might be more prosperous some years were his land all given to one product, yet in a succession of years he receives a greater income by having a variety of crops.

24. Course of Rotation. What is known as the *course of rotation* is the order in which the crops regularly succeed each other. Local conditions are so varied that a course which would be suited to one locality might not be adapted to another, therefore, no specific directions for a course of rotation are attempted. The arrangement shown in the table, which is taken from *Agriculture for Beginners*, shows the principles by which the farmer should be guided:

FIRST YEAR		SECOND YEAR		THIRD YEAR	
Summer	Winter	Summer	Winter	Summer	Winter
Corn	Crimson clover	Cotton	Wheat	Cowpeas	Rye for pasture

It will be noticed that two crops are provided, cowpeas and crimson clover, which have for their purpose the improvement of the soil by restoring nitrogen and at the same time providing a crop of hay; two crops for money—wheat and cotton; two cultivated crops which admit of tillage to kill weeds and for physical improvement of the soil, and two crops suited to livestock—corn and rye for pasture. This arrangement shows the objects to be attained through a course of rotation, and while the crops here given would not be suitable to all localities, other crops can be substituted in such a way as to preserve the plan and enable the farmer to attain the purposes indicated.

The rotation most generally practiced in the corn-growing states is grass and clover three years; corn two years; wheat or oats one year. What is known as the Norfolk System, from Norfolk County, England, is also in use in those sections not admitting of a winter crop. The original system produces four crops, each for one year, as follows: turnips, barley, clover, wheat. Where used in the Dominion, this system is modified to meet local conditions.

DISEASES OF PLANTS

25. Injurious Effects. Nearly all plants raised upon the farm are subject to disease. The diseases are caused by minute plants (fungi or bacteria) which live upon or within the plants that they injure or destroy. These plants are so small that single specimens cannot be seen without a magnifying glass, and some of them only by the aid of a compound microscope. The damage done to cereal crops alone in the Dominion by plant diseases is estimated at millions annually. In addition to this, nearly half of the apple crop is lost each year by rot, and in some localities the entire peach and plum crop is destroyed in a similar manner. Much of this loss could be prevented if the farmers knew what to do.

26. What to Teach. The prevention and destruction of fungi causing plant diseases depend upon a knowledge of the manner of growth, length of life and changes in form of the fungus causing the respective diseases with which the plants are affected. The lessons on plant diseases should acquaint the pupils with these facts. As far as possible the facts should be learned by direct observation; but those which can be ascertained only through the work of specialists should be given the pupils as they are needed.

The diseases which should receive attention first are those that are causing the greatest damage in your locality. The time at which the lessons are given should depend upon local conditions. The effect of the disease is best seen at that season of the year when the crops reach maturity, but its progress can be studied to the best advantage during the weeks preceding this, and the means of prevention should be considered in the spring before the planting begins. A few diseases, like fire blight and black knot, can be studied in the winter. The lessons should be given when they will be most effective. You should become acquainted with the subject which you wish to teach, both by observation and study. In addition to the information which you can gain from original sources, you should add all that can be acquired from reading the works of good authorities. Be enthusiastic; awaken an interest in the pupils and lead them to become enthusiasts in this work, and their influence will have a very beneficial effect upon the community in which your school is located.

27. Preliminary. The pupils are probably familiar with mushrooms and puffballs. Have each pupil bring to the class a ripe specimen of mushroom and puffball, if these can be obtained. The large mushrooms with gills are the best for this exercise. After picking, they should be kept with the top down.

Have each pupil lay a piece of paper on the desk. If the mushroom is white, use colored paper; if dark, use white paper. Break the stem from the mushroom close to the gills, then lay the top on the paper, gills down; cover with a glass and leave in this position for a half-hour or more. When you return to the exercise, ask the pupils to remove the glass and the mushroom from the paper very carefully, raising each directly up and taking care not to create the least current of air. What does each pupil find upon his paper? (If the experiment has been successful an imprint of the under side of the mushroom will have been formed on the paper by the spores which have fallen from between the gills.)

Ask one of the pupils who has a ripe puffball to squeeze it. What forms the cloud of dust? Catch some of the dust on white paper. Can you see the separate grains? What about their size?

From these exercises the pupils should gain some knowledge of the large number of spores produced by plants of this sort, of the minute size of these spores and the ease with which they can be scattered. This will lead them to see why plant diseases can spread so rapidly.

While it is not necessary to describe the minute structure of a spore, you should lead the pupils to understand that in plants of this class it takes the place of the seeds in the more perfect plants they have been accustomed to study.

Caution. Some mushrooms are deadly poisons, and pupils should be told emphatically that they must not eat them.

When these facts are understood, the class can study the plant diseases which are considered most important The topics outlined for study in this division of the lesson are selected because these diseases are generally prevalent, but there are many not named, and some of these may be of equal or greater importance in your immediate locality; hence, you should be guided in your choice of topics by local conditions.

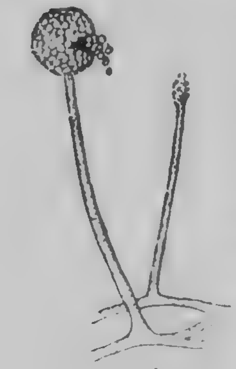
28. Rusts. Rusts appear on wheat and other small grains and grasses. They are so called because of the peculiar color of the spores which they produce. The disease is caused by a minute fungus. It usually begins with little black dots and lines that appear on the surface of the stem late in the summer. These lines are made of innumerable spores which constitute the form in which the fungus survives the winter. In spring each spore begins to grow. However, it dies in a short time unless it is carried to a barberry bush. Upon the leaves of this shrub the spores continue to grow rapidly and soon form little chains of fringed cups on the lower side of the leaves. These cups produce a different variety of spore, which is carried by the wind or other means to wheat, grass or other crops where these spores force their way into the pores of the leaves and mature the fungus that spoils the crop. The fungus has three distinct stages in its life circle, and a complete knowledge of it requires observation extending from one season over to the next. The spores in the spring usually start from self-sown grain; therefore, all such grain should be plowed under early. They also adhere to the straw and are liable to be carried to the field the next season and infest a second crop, if such straw is used for fodder or bedding. Fields affected with smut should have the stubble burned after harvest, and it is usually wise to burn the straw. The margin of the field should be kept free from barberry bushes and other plants on which these spores may lodge. These measures and a frequent change of crops will usually prevent the spread of rust.

Have the pupils examine neighboring fields for the appearance of rust. If it is found, ask them to measure a square foot of the field in some part where the disease appears, count the number of plants within the space measured and also the number affected with rust. From these a very fair estimate of the portion of the field affected can be obtained.

29. Smut. Smut attacks wheat, oats, barley, and especially Indian corn. It is developed and propagated by the means of spores, in much the same manner as rusts. However, the spore of the smut fungus works differently from that of the rust fungus. Some spores are capable of attacking the plant only when it is young. The spore penetrates to the interior and grows toward the end of the stalk, dividing wherever the stalk divides and sending a minute filament into each branch until finally it works to the tips of the shoots which bear the fruit. For this reason the presence of smut cannot be detected until the fungus is fully developed. This is best illustrated in corn. With this plant the smut does not appear to cause any damage until the kernels are well formed. Then in the course of a few days those at the end of the ear swell, burst and throw out a large quantity of black powder which consists of the perfected spores. These can be carried long distances by the wind. They lodge in the soil, fall upon manure heaps or find homes in other suitable places, where they develop a second kind of spore which is carried to the corn plant the next season and begins its career on the new crop.

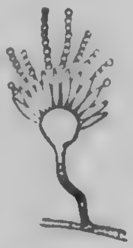
Because of the large number of spores and the way in which the fungus works, smut is very difficult to eradicate. Whenever possible, the ears affected by it should be destroyed and seed from an affected field should not be planted. When smut attacks oats or barley, it may not be discovered until thrashing time, then the escaping spores form clouds of black dust. Spores can be destroyed on the seed by soaking the seed from ten to fifteen minutes in water raised to a temperature of 132 to 135 degrees Fahrenheit. The heat should not exceed the latter temperature and the seed should be thoroughly stirred so that the water may be brought in contact with the entire surface of every kernel. This treatment does not injure the vitality of the seed and it often saves the farmer a crop. When a field is badly affected with smut it should be planted to some crop upon which this fungus cannot work. One or two seasons of this treatment will eradicate the disease.

30. Potato Blight. There are two forms of potato blight, known as the early and the late blight. The pupils should be asked to look for the appearance of this disease, and if found it should be studied. The early blight is due to the growth in the tissues of the leaves of a fungus which causes the leaves to turn yellow and dry up. This blight does not usually affect the tubers. However, if it begins early in the season, it decreases the yield. The later blight is likely to attack the crop during warm, damp weather. It sends its filaments down the stalk into the tubers and causes them to rot. Farmers not understanding the nature of this disease think that the rot is due to some condition of the soil. Both of these diseases can be prevented by spraying the vines with Bordeaux mixture (See Section 45). Usually three applications in a season will preserve the plants in good condition. Sometimes the spores from this blight do not develop until the tubers have been stored for the winter, and the farmer is much surprised to find that his potatoes are rapidly decaying.



WHITE MOLD

31. Scab. Another disease which is likely to affect potatoes is scab. Doubtless pupils can bring potatoes that have been attacked in this way. Examine the scabs with the magnifying glass. Each scab is a plant and grows from a spore. The spores may exist in the soil before the potatoes are planted. This will be true if the ground produced a scabby crop of potatoes the previous season. If affected potatoes are planted, an affected crop may be expected; therefore, only healthy potatoes should be used for seed. The scab can be prevented by dipping the potatoes, before planting, in a solution made by adding a pint of formalin (a liquid that can be obtained of any druggist) to fifteen gallons of water, and allowing them to remain in the solution from one and one-half to two hours. Formalin is not poisonous, but potatoes thus treated should not be eaten nor fed to stock. Study the apple scab in the same manner. Doubtless in the fall numerous apples having black scabs on the surface can be obtained. These are caused by another sort of fungus which works upon the apple in a similar manner.

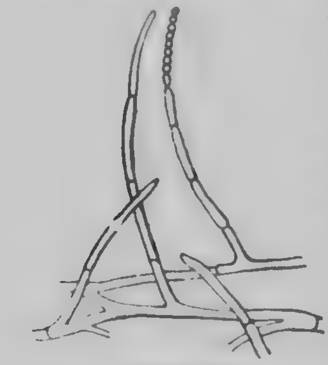


BLACK MOLD

32. Molds or Mildews. Place a piece of bread in a damp, warm place where it is excluded from the light and allow it to remain for several days. Have the pupils, with a magnifying glass, examine the mold formed. With a glass of good power some very interesting forms will be discovered. There are many species of mold or mildew, and they attack numerous plants, especially the rose, grape, plum and peach, and often cause serious damage. The most common forms are shown in the illustrations printed on pages 96, 97 and 98. They are highly magnified. Mildew on grapes can easily be detected by examining the under side of the leaves, where it appears in the form of pale spots or scales, which are covered with silky, thread-like organs. The mold on fruit usually appears as a whitish bloom or roughish brown coating. The latter is known as brown rot, and it is very destructive to plums and peaches. The fruit so affected

BLUE MOLD

often remains on the tree and dries, forming what are known as *mummies*. These dried fruits are full of spores, and unless they are destroyed will constitute a source from which the disease will be propagated to the next crop. The brown rot and most other mildews can be prevented by spraying either with a simple solution of copper sulphate in a proportion of one pound of sulphate to eighteen or twenty-five gallons of water, or by a weak solution of Bordeaux mixture. Two or three sprayings during the season will be necessary to preserve the fruit, and the result depends almost entirely upon the thoroughness with which the work is done. Every branch and leaf of the tree should be touched by the spray.


MILK MOLD

If fruit is grown in the locality in which your school is located, lead the pupils to watch for the appearance of these molds and then secure their interest in spraying trees.

33. Other Diseases. The plans given show what can be done with other plant diseases. Each school should have a microscope for the examination of plants affected by smut or other diseases, and each pupil should have a small, inexpensive one. Send to the experiment stations of Canada for information on diseases prevalent in that locality, and you will secure much valuable assistance. Send to the Department of Agriculture, Washington, D. C., for Farmers' Bulletin No. 75, on *Grain Smuts and How to Prevent Them*, also for Bulletin No. 20 of the Bureau of Vegetable Physiology and Pathology. Each of these works will furnish valuable information.

DESTRUCTIVE INSECTS

34. Classes. For the purpose of destroying them, insect pests are considered under two classes, biting insects and sucking insects. This distinction is important, because insecticides that are effective with the first class are harmless to the second. Biting insects feed upon foliage, and any preparation which poisons the leaves of the plant destroys the pest. Sucking insects feed upon the juices of plants and extract them by boring through the outer tissue or bark; therefore, poisoning the foliage has no effect upon them. A preparation which poisons the insect by contact must be employed. Spraying mixtures containing Paris green or London purple will usually destroy biting insects, and a preparation of kerosene known as kerosene emulsion, or a solution of tobacco soap, will destroy most sucking insects Where plants can be enclosed, lice can usually be destroyed by fumigating the plants with tobacco or with carbon disulphide. In all cases spraying or fumigating is most effective if applied early, as soon as the insects are discovered. See Section 45 for spraying preparations.

35. Directions. Lead the pupils to understand the facts here given and to apply them in connection with the study of insect pests. For the life study of these insects, follow the plans given on pages 39–50, Sections 2 to 24, inclusive. In studying insect pests, it is necessary for the pupils to learn:

(1) To recognize the insect in each stage of its growth—the egg, the larva, the pupa and the imago.

(2) How long the insect lives in each stage.

(3) Upon what the larvae feed.

(4) The time and place of laying the eggs.

(5) How the insects pass the winter.

(6) How the ravages can be prevented.

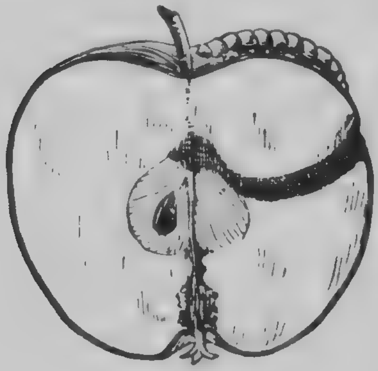
To ascertain these facts it will usually be necessary for the class to continue observations through a year.

36. Cabbage Worm. What sort of butterfly is seen around the cabbages about the time the young plants begin to head? Have the pupils catch some of these in the insect net and place them in their cages. Place fresh cabbage leaves in the cage each day. Do the butterflies lay eggs on the leaves? Put some worms in the cage and feed them till they change to the chrysalis stage. From what is the chrysalis suspended? How long does it take it to hatch? (In the North there are usually three broods in a season; in the South the number of broods is greater.)

The cocoons of this butterfly are often found in the fall, suspended from the under side of fence boards, railings and other similar shelters. By placing boards on the ground in a cabbage patch in such position that the worms can crawl under them, many cocoons will be fastened to the boards and these can be collected and destroyed. This is one of the most effective means of keeping this pest in check. Since poisons cannot be used after the plants begin to head, they have but little effect.

37. Codling Moth. How many of the class ever found a worm in an apple? How did it get there? What is it there for? Lead the pupils to examine the apples on a tree early in the season, very soon after the blossoms fall. Are any milk-white spots found on the growing fruit? If so, examine some of them with your strongest magnifying glass. Can you tell what they are?

Have each pupil select a few affected apples on a tree at his home and watch these spots from day to day. What change finally takes place in these spots? What becomes of the worm? When does the worm leave the apple? Where does it spin its cocoon? Later in the season, in early autumn or in midsummer, pupils should look for these cocoons under the scales of the bark on the trunk of the tree. Doubtless a number will be found upon each tree. If these scales, which form the rough bark, are scraped off, many cocoons are destroyed and one of the



CODLING MOTH

favorite places for spinning the cocoons is removed. This can be done without injury to the tree. Have the pupils collect a few cocoons and keep them in a safe place until they hatch in the spring. In this way they will be able to recognize the moth, which is seldom seen. Do not let the moths escape.

It is estimated that the damage done by the codling moth in the United States and in the Dominion of Canada exceeds $9,000,000 each season; therefore, any preventive measures which will stay its ravages should be understood and employed. The following are among the most effective:

(1) Since decaying fruit trees form the best places for hatching the cocoons, all such trees, as well as all brush in and about the orchard, should be destroyed.

(2) The trees should be sprayed with Bordeaux mixture just as the blossoms fall, and again in about a week or ten days.

(3) Trunks of trees should be kept smooth, so that the worms cannot find lodgment for the cocoons.

(4) Many cocoons can be collected by banding the trees with strawboard, cotton flannel or any other fabric that will form a shelter to the worms.

(5) Wormy apples usually fall to the ground before the perfect fruit is ripe. These should be gathered as soon as they fall and so disposed of as to kill the worms before they emerge to spin cocoons. They may be used for making cider or feeding pigs.

38. The San Jose Scale. The San Jose scale is a minute insect covered with a circular scale of ashy gray color and about one-sixteenth of an inch in diameter. The young are brought forth alive; the insects multiply at an almost incredible rate and in a short time cover the bark, leaves and fruit of the infested plant. The scale is a sucking insect; a plant infested with it has no chance for growth, and little for life. A tree covered with this scale has the appearance of being dusted over with ashes. The young crawl about for a short time after birth, but the insects cannot fly, hence they are unable to travel from one plant to another unless the branches interlace. They sometimes, however, attach themselves to other insects and are carried in this way.

This scale is one of the most destructive insects with which the fruit grower has to contend. It thrives equally well on a number of plants, including the peach, plum, pear, quince, apple, apricot, gooseberry, hawthorn, rose, spirea, maple, English walnut, elm and persimmon. The most effective treatment for San Jose and most other scales is to spray the dormant trees in late winter with the lime-sulphur wash. This is made by adding five pounds of quicklime to about two gallons of water in an iron kettle. Boil and stir in slowly four pounds of powdered sulphur. Boil for an hour. Dilute to twelve gallons with water. This must be applied while the buds are still completely dormant.

All fruit trees should be examined every spring for scales. If any are found, the trees should be sprayed at once with a mixture of lime, sulphur and salt. The natural enemies of the scale are a small fly which is a parasite, and some species of beetle known as lady-bugs or ladybirds. It is also supposed that the scales are affected with a fungous disease, but this is not definitely known.

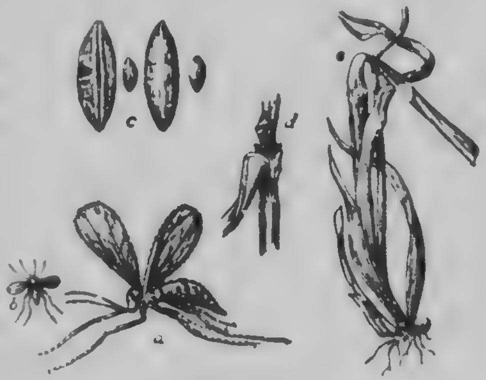
Send to the Department of Agriculture, Washington, D. C., for Circular No. 42, second series, *How to Control the San Jose Scale.* Also get Canadian pamphlets on this subject.

39. Other Insects. With insects as with plant diseases, those that are most destructive in your locality should receive first attention. In addition to those already named in this division, the following should doubtless receive attention: The Colorado or potato beetle, the squash bug, the striped cucumber beetle, the currant worm, the rose slug, the tent caterpillar, apple-tree and peach-tree borers, the plum curculio, plant lice, in grape and cotton regions the insects which attack these plants, respectively, and in wheat regions the Hessian fly, the chinch bug and the weevil.

INSECT ENEMIES

40. Aid to the Farmer. The farmer is not left to fight noxious insects single-handed. Nature has provided numerous enemies which lend their assistance to the destruction of these pests. Chief among these enemies are other insects, birds, those animals which feed upon insects, and certain fungous diseases whose ravages often destroy large numbers.

41. Parasitic Insects. Insect parasites consist of smaller insects which lay their eggs in the larvae of the larger. The egg hatches and the larvae of the parasite live and grow by feeding upon the tissues of the larvae upon which the eggs are deposited. In this way the larva of the host is destroyed. The most numerous family of parasites consists of the ichneumon flies. These vary in size from half the size of a mosquito to minute flies that can scarcely be seen with the naked eye. They are of great value in destroying those insects which are injurious to growing crops. The chalcis flies are also valuable in destroying the codling moth, and the tachina flies destroy the Hessian fly, one of the worst enemies of growing wheat.

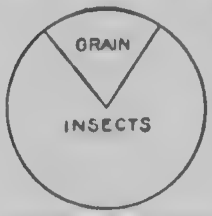


HESSIAN FLY

a. Fly, magnified; *b*, natural size; *c*, pupa cases ("flaxseeds") in different stages, natural size and magnified; *d*, barley stem, showing "flaxseeds" in position; *e*, stem bent down as a result of the work of the Hessian fly.

42. Birds. Birds are among the farmer's best friends, but often they are looked upon as enemies. On pages 20-36 of this volume you were given a plan for the study of birds. You should now have the pupils turn this suggestion to practical account by studying the economic relations of birds to man. A careful study of this plan on a few of our most common birds will show that with rare exceptions birds are beneficial in destroying insect pests.

The nestlings of some birds, particularly of the robin, the crow and the sparrow, which in the adult stage feed to some extent upon fruit and grain, are wholly insectivorous; therefore, while at certain periods these birds may commit slight depredations upon crops, the insects which they destroy during the season would cause much greater damage.

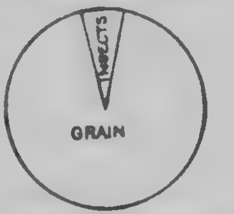


RED-WINGED BLACKBIRD

Have the class make a study of the food of a few birds that can be observed about the home. The illustrations show the relative proportions of insects, grain or fruit that constitute the food of the adults of a few common birds. These are fairly representative of many others. They illustrate more forcibly than words the folly of killing the birds or attempting to do away with them.

(a) The Robin. Let each pupil select a robin's nest that is in a good place for observation. Watch the nest for an hour at a time at different periods of the day, as morning, midday and evening. How many times are the young birds fed each hour? Make a note of what is given them at each feeding, as, earthworm, caterpillar, bug. Make the first series of observations soon after the birds hatch, the second in about a week, and the third in two weeks. Compare results. At the rate observed, how many insects would this family of robins consume during a season?

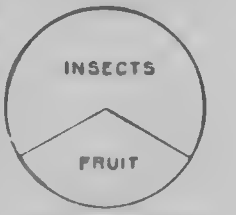
(b) The Sparrow. The chipping sparrow is one of the most common birds about lawns and yards. Its habit of building its nest in low bushes by the side of walks makes it one of the most convenient birds to study. The chipping sparrow is easily tamed and will often come on to the porch, the threshold or the window sill to pick up crumbs. Use the same plan for study as with the robin.



ENGLISH SPARROW

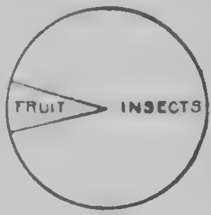
What does the chipping sparrow feed its young? Of what does the food of the adult consist? (About two-thirds of the food is vegetable, one-half of which is doubtless seeds of wild plants and the other half grain.) The young eat cutworms, weevils, crickets, grasshoppers, bugs and spiders.

(c) THE WOODPECKER. Woodpeckers are more difficult of observation. The points to be determined in their study are the extent to which they damage trees and the extent to which they prevent injury to the same trees. Some species are more injurious than others, because they drill larger holes into the tree. What is the woodpecker after when it drills through the bark? How can you find out? Why does the woodpecker strike the tree in various places before drilling?



BROWN THRASHER

By experimenting on an old tree that is of little value, the pupils can partially satisfy themselves on these points. Direct them to cut away carefully the bark around a hole drilled by the woodpecker, then by cutting the wood away carefully follow this hole to the end. Does the hole drilled meet an excavation made by a borer? Experiment with several holes. Do all of these lead to holes of borers? If not, why are the others made?



BLUEBIRD

The greatest injury which woodpeckers cause trees is in the loss of sap in the spring, which leaks out through the holes that they have drilled in the bark. The large woodpeckers which drill large, deep holes are consequently more injurious than the smaller species.

(d) THE CROW. Do crows remain in your locality throughout the year? If not, when do they migrate in autumn? At what date do they return in the spring? Why do farmers generally wish to kill crows? Is the crow the farmer's friend? How can you determine? How can cornfields be protected from crows?

At least one-fourth of the crow's diet is animal, and it eats bugs, grasshoppers, cutworms, tent caterpillars and noxious animals, such as mice and snakes. While the crow destroys some corn and fruit, in most localities it probably more than repays for this damage by the large number of noxious insects which it destroys.

Study other common birds in a similar manner. In order to satisfy yourself about the food of any bird you will have to make many observations, and probably will not arrive at a full knowledge of what the bird eats without studying it for two or three seasons. To assist in this study make a chart according to the plan here given. This plan can be extended whenever it is necessary to add another insect to the list. It is a good plan to have the oldest pupils construct charts of this kind and observe birds through the summer, then bring these charts to the school sometime in the fall term and compare notes. A star in the chart indicates that the bird eats the animal or vegetable matter named at the top of the column:

	Grain	Weed Seed	Fruit	Caterpillars	Bugs	Beetles	Grasshoppers	Ants	Spiders	Earthworms	Cutworms	Cankerworms	Small Animals	Miscellaneous
Robin			*	*		*	*		*	*				
Sparrow	*					*	*							
Woodpecker			*			*		*	*					*
Crow	*		*	*			*						*	*

43. Other Animals. The most important of the insect-eating animals of this group is the toad. Have the pupils study the life history of this little animal. In so doing they will learn how it feeds, what it eats, and many other interesting facts. Toads should be protected and attracted to the garden. This can be done by providing moist, shady places under leaves and stones for their shelter during the day and by constructing a few little pools of water containing water lilies and other aquatic plants.

Frogs and salamanders may also be considered as insect enemies, but they are of little practical assistance to the farmer.

44. Diseases. As already noted, the San Jose scale is supposed to be affected with a fungous disease which tends to place some check upon its multiplication. A disease affecting the chinch bug has been known practically to destroy this pest over large areas in a single season. At one time it was thought that the chinch bug could be exterminated by inoculating bugs with the disease and liberating them in infested fields, but the results were not so satisfactory as anticipated. Find what diseases destroy other insects.

45. Insecticides. The following insecticides can be prepared and applied by anyone:

(a) PARIS GREEN, DRY. Paris green, 1 pound; lime or flour, 20 to 50 pounds. Mix thoroughly.

(b) PARIS GREEN, WET. Paris green, ¼ pound; lime, ¼ to ½ pound; water, 50 gallons.

Caution. Paris green is poisonous, and all receptacles containing it should be marked *Poison*, and should be kept out of the reach of children.

(c) KEROSENE EMULSION. Hard soap in fine shavings, ½ pound; soft water, 1 gallon; kerosene, 2 gallons. Dissolve the soap in boiling water, add kerosene to the hot water and churn with a spraying pump until the mixture is changed to a cream and then to a soft, butter-like mass. To get a 15 per cent emulsion the one most commonly used, add 10½ gallons of water to the mixture.

(d) COPPER SULPHATE. Copper sulphate, 1 pound; water, 18 to 25 gallons. This mixture is useful in killing spores before foliage comes in the spring.

(e) BORDEAUX MIXTURE. Copper sulphate, 5 pounds; unslaked lime, 5 pounds; water, 50 gallons. The copper sulphate and lime should be prepared separately and then poured together. By adding 4 ounces of Paris green to 50 gallons of Bordeaux mixture, the mixture is suitable for both insects and fungi. Thus, by spraying potatoes with this combination both blight and potato bugs are destroyed.

(f) AMMONIACAL COPPER CARBONATE. Copper carbonate, 5 ounces; strong ammonia, 3 pints; water, 50 gallons. The copper carbonate should be dissolved in the smallest possible amount of ammonia and the solution kept in stock and diluted when needed.

46. Aids. *Nature Study and Life*, described on page 66, Section 45, contains valuable information and suggestions for the study of insects and diseases of plants.

Agriculture for Beginners. Burkett, Stevens and Hill. 339 pages. Ginn & Company This is a very useful book for both teacher and pupils. The style is plain and simple, the work is remarkably free from technical terms, the subjects treated are such as everyone interested in agriculture should understand, and the illustrations are both beautiful and useful. The work also contains valuable tables and recipes.

Principles of Agriculture. Bailey. 288 pages. Macmillan Company. This work gives a clear and systematic discussion of the elementary principles of agriculture. It covers about the same ground as *Agriculture for Beginners*, but is designed for more advanced students.

How to Make School Gardens. Hemenway. 107 pages. Doubleday, Page & Company. This little work gives many valuable hints and suggestions about making the school garden and the lessons which can be taught from it. It is beautifully illustrated with drawings and halftones.

Among Country Schools. Kern. See Volume Three, page 33, Section 28.

You should write to the agricultural experiment station of your state for such literature and assistance as it can furnish in the work. You will find that your request will meet with a liberal response.

Bulletins and circulars from the United States Department of Agriculture: Besides those already mentioned in the chapter, the following will be found helpful:

Circular No. 84, *The Grasshopper Problem and Alfalfa Culture.*

The Food of Nestling Birds, by Sylvester D. Judd. Reprint from a yearbook of the Department of Agriculture for 1900.

Farmers' Bulletin No. 132. *The Principal Insect Enemies of Growing Wheat.*

Farmers' Bulletin No. 146. *Insecticides and Fungicides.*

Farmers' Bulletin No. 196. *Usefulness of the American Toad*

Farmers' Bulletin No. 243. *Fungicides and Their Use in Preventing Diseases of Fruits.*

Farmers' Bulletin No. 247. *Control of Codling Moth and Apple Scab.*

Farmers' Bulletin No. 250. *Prevention of Stinking Smut of Wheat and Loose Smut of Oats.*

Bulletin 195. *Simple Exercises Illustrating Some Applications of Chemistry to Agriculture.* United States Department of Agriculture, Washington, D. C. This bulletin should be in the hands of every teacher of elementary agriculture.

WORK BY GRADES

47. Intermediate Years. The work in elementary agriculture in the fourth and fifth years is so closely related to the lessons in botany and zoology that a separate outline is not necessary. The agricultural phase of these subjects consists in the emphasis placed upon their economic features. (See pages 67–70, Sections 47–58.)

48. Sixth Year. This grade should receive lessons in agriculture:

(1) Testing Seeds. (Section 16.)

(2) Planning the garden (school or home garden). Deciding what to plant in the garden, and why. Care of the garden through the season. (Sections 3-6).

(3) The study of weeds. (Sections 17-20.)

(4) Selecting seeds as crop ripens. (Sections 12-15.)

49. Seventh Year. This grade can begin the study of many of the practical problems of the farm:

(1) The study of soils. Different kinds of soil. Their formation. Fertility and characteristics. Fertilizers. Water in the soil. (Sections 7-11.)

(2) The farm crops: the kind of soil best suited to each crop. What crops are the most profitable, and why. Rotation of crops. (Sections 21-24.)

(3) Destructive insects and how to treat them. (Sections 34-45.)

50. Eighth Year. There are so many topics that can be studied in this year that selection is somewhat difficult. In general, the class should study the subjects which have the most direct bearing on the interest of the locality.

(1) Continue the study of insects and crops begun in the seventh grade.

(2) Study plant diseases and the means of preventing them. (Sections 25-33.)

(3) Make an economic study of one or two chief crops of the locality after the plan for the study of corn, pages 6

(4) The care of stock. Dairying. Poultry raising.

TEST QUESTIONS

1. Give three reasons why the elements of agriculture should be taught in the public schools.

2. Why should the younger pupils have their plot in the school garden in common? Why should there be one or more experimental plots to be used by the school?

3. Which will hold the larger quantity of water in the form of film moisture, coarse or fine soil? Give reasons for your answer.

4. What are the chief crops in your locality? Give your plan for having the pupils of seventh and eighth years select, preserve and test the seed for planting each of these crops the following season.

5. Why is the study of weeds of practical value? What weeds should receive special attention in your locality?

6. What is meant by rotation of crops? Show by specific illustration how rotation of crops is profitable to the farmers in your locality.

7. To what extent are the farmers of your locality conversant with successful methods of preventing diseases which attack their crops? How can you through the school assist them to a better knowledge of this subject?

8. What are the chief insect pests in your locality? Why are these insects more numerous than others common to the locality? How can the school assist in the destruction of these pests?

9. Why should pupils record their observations in agriculture in a notebook devoted to that purpose? Give a specific illustration for each reason in your answer.

10. Show how you would introduce the study of agriculture into a rural school. What objections to its introduction are you liable to meet?

51. Type Study on Corn

Suggestions as to Method

(*a*) This is to a large extent a historical topic and may be illustrated with pictures from the various periods of history included.

(*b*) Make a collection of the products and by-products of corn, as several varieties and sizes of ears, bottled samples of meal, bran, starch, glucose, breakfast foods, etc. Bottled collections can be had from various manufacturing companies, as the Corn Products Company of Chicago, the American Starch Company of Oswego, N. Y., etc.

(*c*) The later maps in the geographies show the corn belt in the United States and its extensions north and south.

(*d*) If possible, take the class to a museum which has a complete collection of corn varieties and corn products.

(*e*) The practical bulletins on corn selection, cultivation, soil treatment, crop rotation, injurious insects, silos, etc., can be had from the State Agricultural Experiment Stations in Illinois and other states of the corn belt, and from the Dominion Farm at Ottawa.

(*f*) A comparison of the corn region with that for wheat and other grains, for cotton and other staples is a very profitable study. Maps showing these areas are in the geographies.

(*g*) This topic is one of much present interest in connection with agriculture in the schools and in farmers' institutes.

(*h*) The supplementary references in geographical readers, in history and in literature, as in *Hiawatha*, the *Corn Song*, etc., are well worth attention.

Outline of Topics

1. Corn in the native wild state.
2. Cultivation of corn in Indian villages.
3. The pioneer settlers and their use of corn.
4. The prairie and other farmers of the corn belt.
5. The inventions and machines connected with corn production. Manufacturing plants for agricultural machinery.
6. The cultivation of corn at the agricultural departments of the universities. Experiments by scientific experts.
7. Extension of corn cultivation north and south of the corn belt.

8. Other corn-producing countries in America, Europe, Asia, Africa, etc.

9. Corn turned to bad uses—whiskey.

10. Corn compared with other important cereals—wheat, rice.

CORN

1. Corn in its various uses has become one of the great staple products which figure in the large concerns of the world market.

The corn belt in the United States is peculiarly interested in the successful cultivation of corn. In a larger sense corn is produced in nearly all parts of the United States and in some parts of Canada, and is hardly surpassed in importance.

Originally the corn plant was a wild specimen of the grasses growing in the warm subtropical parts of America, as in Mexico. We may suppose that even then it was of some value to the birds and animals feeding on grain, as are the wild rice, the weed seeds, and the nuts and fruits growing wild upon the trees and bushes. The Indians probably found it good relishable food where they could pluck it in the milk or later in the ripened grain.

In the wild state the ears were smaller, as the ground was not cultivated and there was no selection of seed. As in the case of other grains and fruits, it has taken centuries and perhaps thousands of years to develop corn from its primitive wild state, where the stalks were short and the ears small, to the large, fruitful stalks and ears of our best varieties of corn today.

2. The white men, when they first came to the eastern and southern parts of the United States, found the Indian women cultivating corn in small fields about their villages. By this time the corn plant had spread northward from the semitropical countries, and under cultivation had become a strong, hardy plant producing good large ears. In New England and in Virginia, the early settlers found it a strong necessity to procure corn from the Indians, who stored it away in baskets

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for the winter supply of food. The first explorers of the Illinois River valley under LaSalle found stores of corn in the Indian villages.

Along the valleys of central New York, among the Iroquois, were many villages and quite extensive fields of Indian corn, which gave a settled aspect to the country and brought about the beginnings of social and political life and a stronger organization of society.

The Indians had interesting legends of the corn plant, like that which Longfellow has told in *Hiawatha*, which expressed their notion of the importance of corn to them as a people. They had learned not only how to plant and cultivate corn, but also interesting modes of cooking and using it in palatable dishes, which were learned by the early settlers and have remained common to this day, as corn meal mush, hominy, hoe cake, or pone cake.

In central New York, in the Maumee valley of Ohio and in other Indian settlements, the power of the hostile Indians was finally broken by destroying their villages and laying waste their corn fields.

3. The pioneer settlers in Virginia and New England suffered much from hunger till they had learned from the natives how to plant and raise a corn crop. In Virginia the starving time well-nigh destroyed the colony before they divided up the land into small farms and allowed each man or family to clear the ground for the planting of corn, beans and pumpkins. But from that time on there was abundance of food.

In pushing westward upon hunting and exploring trips the pioneers carried with them for food a store of parched corn, and sometimes they sent forward in the early spring a few men to plant fields of corn for use by the later settlers when they arrived during the summer and fall. This was the case with Robertson, who settled at Nashville.

John Fiske says that on account of corn being more easily raised, harvested and changed into food than wheat and other grains, it had a great influence upon the rapid settlement and the westward movement of population during pioneer times.

Not only in the hard labors of the pioneers did corn figure, but in their social festivities. The corn-husking frolics were among the chief of social events, and the song of the huskers celebrated their festive sports. On Thanksgiving day even till now we gather in the yellow or speckled corn and the tall yellow fodder to decorate our houses and schoolrooms. Popcorn has likewise long held a favorite place at family gatherings and in the fun and frolic of the children.

Throughout the eastern states and far into the Ohio valley it was necessary to cut down the forests and clear away the brush and logs before a corn crop could be raised. This rendered the early life of the pioneers hard and laborious. Even upon the prairies the tough sod, which had never been disturbed, had to be broken by the heavy breaking plow with one or more yokes of oxen, and it required one season to rot the heavy matting of grass roots before the full crops could be secured. But the ground once broken or cleared was rich in vegetable mold and produced surprising crops of corn and other grains, melons, vegetables, fruits, etc.

4. But the uses of corn in early pioneer days were only the beginning (and a very small beginning) of that vast and profitable farm business of corn-raising which is now carried on in what is known as the *corn belt* of the United States. The few hundreds and thousands of bushels raised in pioneer days have grown into the millons, hundreds of millions and even billions of our present enormous production. Instead of a few little patches in the river bottoms and around the Indian villages, instead of a number of scattered clearings for corn in the boundless forests of the Ohio valley, we now find corn fields stretching away, field after field, over millions of acres.

As the early immigrants moved across the Alleghanies into the Ohio valley and opened up new farms, they soon found that they were raising more corn, grain and stock than they could use. These new-found lands were so rich that they gave an abundant surplus. The great question in those early days of the nineteenth century was how to find a market in which to dispose of their surplus products. They began to raise pigs and cattle and sheep and horses, but soon they had too many of these also. Some of these products of the corn belt they loaded upon flatboats and sent down the river to New Orleans. As soon as the Erie Canal was built they began to ship their surplus corn, meat, etc., by way of the lakes, Erie Canal and Hudson to New York. The Old National Road across the Alleghanies helped them, but much more the Pennsylvania, New York Central, Baltimore and Ohio and other railroads, which were built to carry the products of the corn country to New York, Philadelphia and Baltimore. So great were the products of the corn country that they overflowed beyond New York and Philadelphia and were loaded upon ships for Liverpool, Hamburg, Havre and other parts of Europe. In later years the spread of population led to a large production of corn in Canada, especially in southern Ontario, where the climate is mild. Corn is also raised in the other provinces, and it is used generally for feeding stock.

Corn is the chief product of the corn belt, but closely dependent upon it are several other large farm industries, as pork and cattle raising, the dairy and creamery business, the canning of corn, whiskey production in the distilleries, and the great milling industries dependent largely upon corn. In the feeding of stock, as hogs, cattle and horses, the corn is changed into other farm products of increased value, and the manures so much needed for preserving the richness of the soils are retained on the farm.

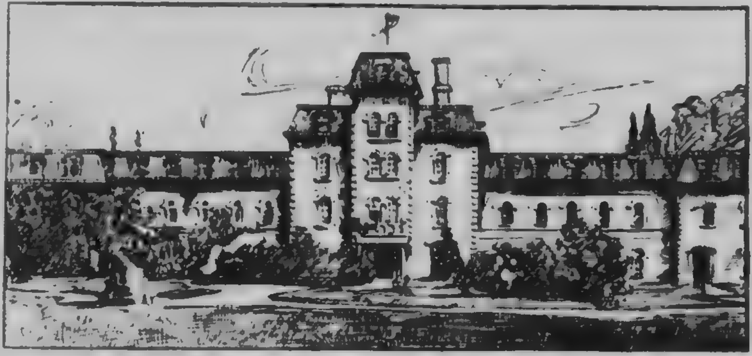
In the silos constructed for feeding dairy cows, not only the ears of corn but the stalks and leaves are converted into a nutritious food of the best kind for producing milk and butter. In recent years many various products of corn have been found serviceable as food for the people, new dishes have been discovered, and it is claimed that corn can be used far more extensively as a nourishing food for human beings. Good corn bread can hardly be surpassed by any kind of warm bread. Hominy and grits are very extensively used in some parts of the country. Corn meal mush and corn flakes are among the best of breakfast foods. Roasting ears in season and canned corn are important food articles in the groceries. From the sale of corn or of corn-fed meats and of dairy products, the farmers of the corn belt have grown well-to-do and independent. They have been able from sale of the products of the corn fields to supply themselves with other foods and clothing, fruits and drinks, as tea, coffee and chocolate, and the hundreds of manufactured articles of many sorts which are needed by farmers' families. Even the luxuries such as fine china and glass, imported silks and laces, pictures and libraries, pianos and automobiles are now very common articles at farmers' homes. Thousands of well-to-do families of the corn belt are able to send their children to good schools, to put them later through college and university and to train them for any of the higher professions or for a lifework in any of the technical and skilled industries. In fact it is from such farmers' families that many of the best educated and most useful men and women of our country are now coming.

5. The rapid development of corn production throughout the corn-growing belt has brought about a great improvement in the machines for planting, cultivating and harvesting this crop. Among the notable machines invented for these purposes are the following: plows, corn-planters, cultivators, steel-toothed rakes, corn-huskers, corn-shellers, corn-cutters, silos and silage-cutters, machines used in canning corn, various forms of corn elevators and roller mills and other milling machinery.

For the construction of these machines enormous manufacturing plants have been established at Chicago and in many other cities in Canada and the United States. The general improvement in agricultural machinery and methods of cultivation has been one of the greatest proofs of progress in America.

6. The importance of the corn fields to our people is shown in a striking way at the great universities. In the agri-

cultural department of the University of Illinois experiments have been conducted by scientific experts for the purpose of increasing the productiveness of Illinois farms. In the cultivation of corn a careful series of experiments has been carried on which has opened the eyes of the farmers. It has been shown that the farmer by careful selection of seed, by proper fertilizing and treating of the soil and by the best modes of cultivation can produce nearly three times as much corn to the acre as at present. In short, the farmers might be twice as rich as they are and could more than double the number of millions of bushels they have to sell or feed. This makes it worth while to study scientifically the best methods of treating the soil and of cultivating corn.



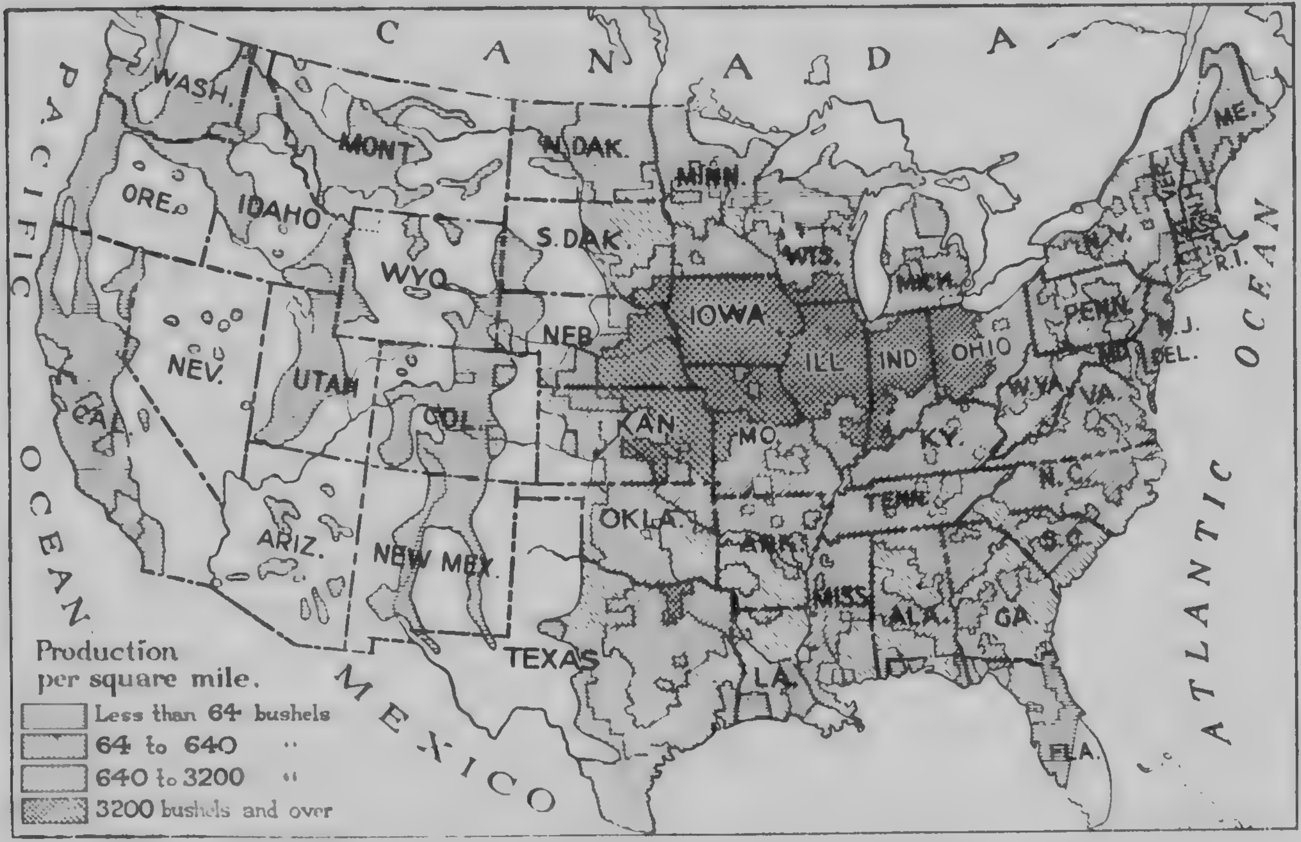
MAIN BUILDING, ONTARIO AGRICULTURAL COLLEGE

On the university experiment farm are many plots of ground where different kinds of field corn are raised and different modes of cultivation tried out, and where different fertilizers are tested as to results upon the crops. The selection and development of the best varieties of corn have been worked out with great care. In the farmers' institutes all over the state the people are made acquainted with the results of these experiments, and the farmers' boys are called in and trained in corn-testing. The majority of older farmers go on raising corn in the old way, but in many farm neighborhoods these better, more scientific methods of corn-raising and corn-feeding are gradually introduced and worked out to success.

At the university experiment stations, college professors who have thoroughly studied plant and animal life, who are well posted in physics, chemistry and biology, who have made a study of soils and fertilizers are constantly at work applying their knowledge of all these subjects to the raising of corn. For the most successful cultivation of corn depends upon many kinds of scientific knowledge. The corn plant itself in its various stages of growth must be understood. What kind of soil elements are needed and what are the chemical elements in such soils? Some soils are deficient and require the addition of certain definite fertilizers, as potassium or nitrates, in order to raise good corn. The soil itself requires, according to its quality, different kinds of treatment, with plow and harrow, or tile drainage, or rotation of crops from year to year. Certain insects, as chinch bugs, are destructive to corn crops, and it is a scientific problem how to get rid of them.

The University of Illinois is only a type of the school that is helping the farmer. The state universities of Indiana, Iowa, Kansas and Minnesota, the Ontario Agricultural College, the Manitoba Agricultural College and the Provincial Agricultural College of Saskatchewan are among the institutions which are carrying on such work in theory and in practice. The Dominion experimental farms should also be mentioned.

7. But the corn-producing region stretches far to the south as well as north of the so-called corn belt. In the gulf states corn has always been a valuable crop and should become more so. In Minnesota and the northwest corn is rapidly becoming an important crop, taking the place largely of the wheat fields. In fact, certain varieties of corn have been developed which flourish in northern latitudes. They grow more quickly and ripen more rapidly in the short, warm northern summers where frost comes early. Corn has been raised and ripened in northwestern Canada as far north as 55° N. latitude. Thus a plant that originated in subtropical lands has gradually modified its nature so as to adapt itself



MAP [illegible] — CORN PRODUCTION IN THE UNITED STATES to more northern climates and is now actually cultivated in fields over the greater portion of North America

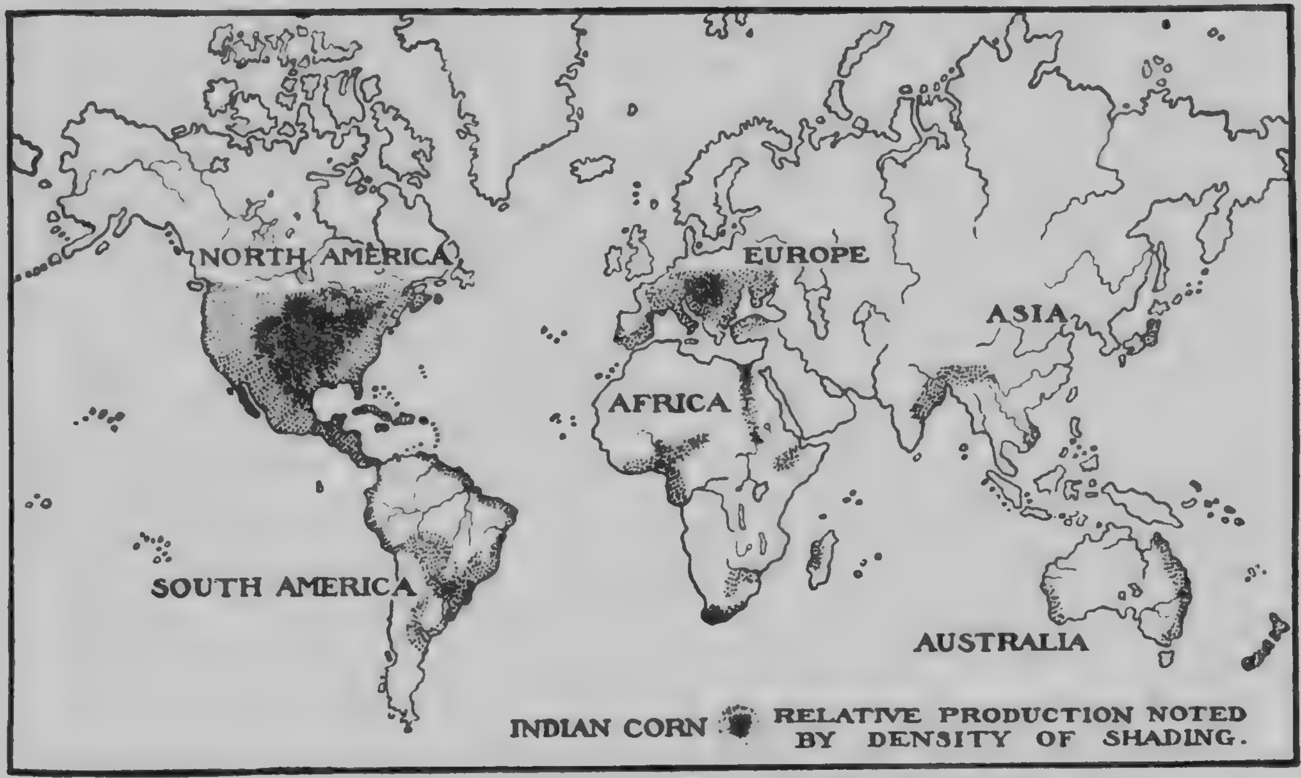
Of course, a great variety of field and garden corn has been thus developed, as the white, yellow and other kinds of field corn, and sweet corn and popcorn among garden varieties,

8. Corn was originally a product of the new world of the west and its chief centers of production are in the United States. But it is now cultivated in the temperate regions of South America where the climate and soil conditions are favorable.

In southern Europe corn is produced as an important crop, as in Hungary, Italy, in the valley of the Po and other warmer parts of southern Europe. In England and Scotland, in North Germany, Scandinavia and Russia corn is not produced as a crop. Corn requires a summer season of warm, sultry days and nights with a moderate degree of well-distributed moisture. Northern Europe is too chilly for the corn. But wheat, oats, barley and rye flourish in these cooler places.

In India, also, and in southern Asia the corn plant has found a home because of favorable soil and conditions of heat and moisture. Parts of southern Australia and Africa are also adapted to corn-production.

9. The corn plant is well known to us as one of the few great cereals which are chief among the food plants for the support of the human race. Like all good things it can be turned to bad use. In the manufacture of whiskey in the corn states, millions of bushels of corn are used yearly. Other grains like rye are also used for whiskey production, but corn is the grain that is chiefly employed. Some large cities, like Chicago, Peoria and Toronto, have distilleries where millions of dollars are invested in the production of whiskey. The large amount of whiskey made is shown by the millions of dollars of taxes collected by the Dominion and United States governments from the distilleries. It is one of the chief sources of revenue to the government, known as excise or internal revenue.


NORTH AMERICA
EUROPE
ASIA
AFRICA
SOUTH AMERICA
AUSTRALIA
INDIAN CORN ● RELATIVE PRODUCTION NOTED BY DENSITY OF SHADING.

THIS MAP SHOWS THE CHIEF CORN-PRODUCING COUNTRIES OF THE WORLD

10. Corn is a somewhat new product that has come into use since the discovery of America, and more particularly in the last one hundred years.

The other grains, like wheat and rice, have been in common use from antiquity. Wheat and rye for bread-making have been in use for thousands of years in Europe, in Egypt and in other eastern countries and later in America. Rice, which is the chief food of the Chinese, is probably as much used for the feeding of the human race as corn, and is now produced in considerable quantity in the southern Atlantic and gulf states.

It has been claimed that the development of the world in civilization has depended upon the successful cultivation of the great cereals.

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52. Type Study on Cotton

Suggestions as to Method

(*a*) The development of the cotton-producing and manufacturing industries has been dependent upon the invention of a whole series of machines. Note carefully how man's remarkable ingenuity has overcome the difficulties and has thus laid the basis for one of the greatest industries in the world.

(*b*) The simple, primitive modes of treating cotton, as separating from the seed, spinning and weaving, need to be clearly explained and illustrated and shown in pictures in order to waken appreciation of the spinning jenny, the cotton gin, the power loom and the cotton picker.

(*c*) The organization of industry (capital, labor, cities, division of labor and large management) in our modern factory system is well illustrated by the cotton industry.

(*d*) The thinking powers of children are well put to the test by explaining the reasons for selecting the centers of manufacture for cotton goods and the chief lines of shipment.

(*e*) The industries dependent upon by-products are a fine illustration of economy in industries based upon modern science and its uses.

(*f*) The location of the cotton belt in the United States and the comparison with other cotton-producing regions give a good map study and consideration of climatic conditions.

(*g*) The other great textiles brought into comparison with cotton enlarge this topic to a great world problem.

Outline of Topics

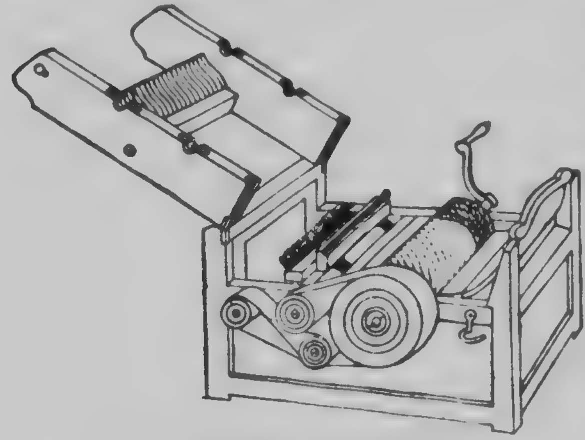
1. Primitive spinning and weaving. Cottage industry.
2. The cotton gin, the cotton picker and cotton press.
3. The spinning mule.
4. The power loom.
5. The organization and management of the factory.
6. Suitable centers for manufacturing.
7. Improvements in transportation. Steam engines.
8. The by-products of the cotton plant.
9. Flax-production in Europe.
10. Hemp in the Philippines and in Kentucky.
11. Wool-production. Wool-growing countries.
12. Silk, China, Japan, Europe, America.
13. Knitting and lace-making.

COTTON

1. Cotton is more generally used for the making of cloth than any other fiber. The United States produces more raw cotton than all other lands together, and we may well inquire how cotton has come to so great importance.

The raising and harvesting of cotton and the processes of changing cotton fibers into cloth involve a long series of remarkable inventions. It is worth while to find out how men, by their inventive skill, have overcome the natural difficulties which stood in the way of the development of this great series of cotton-raising and cotton-manufacturing industries.

More than a hundred years ago, before the modern improvements in spinning and weaving, the work of making cloth from cotton and other fibers was done by hand. The crude hand loom for weaving had been in use for hundreds and thousands of years in many different lands. The spinning wheel was also in common use, and both these primitive machines are still employed in many countries. Up to the time of the American Revolution the old spinning wheel and hand loom were employed and the work was done in thousands of cottages. There were no great factories or mills and there was little division of labor. Making cloth was a house industry carried on by the people scattered in villages in parts of England, Scotland and other countries.



THE FIRST COTTON GIN
After a drawing of the original model

2. In the cotton industry as a whole there were two great problems that had to be worked out before the business could develop the great importance it has at the present time.

First was the difficulty of producing a large quantity of cotton on the plantation, of freeing it from the tightly wrapped seeds and of getting it in baled form for shipment.

In the United States cotton-raising and manufacture did not come into importance till after the Revolution. The planters had begun to cultivate cotton in the southern states, but the work of separating the cotton fibers from the seed was exceedingly tedious and costly. It was done by hand,

and laborers for this and the field work were all too scarce. A Yankee boy, Eli Whitney, going into South Carolina to teach school, was encouraged by the wife of General Greene to devise a machine for more quickly separating the cotton fibers from the seeds. With few tools and much ingenuity he contrived such a machine. By means of circular saws working through wires he pulled the fibers loose from the seeds and carried the seeds away, collecting the lint. The machine was a complete success. One man working by hand all day could separate from one to four pounds of cotton fibers from the seed, while one of Whitney's cotton gins would produce hundreds of pounds of clean fibers in a day. This invention changed the whole face of things in the southland. With plenty of laborers in the field they could produce any amount of cotton, which could be sold very profitably

THE MODERN COTTON GIN

Compare with Whitney's original invention, illustrated on opposite page

to the mills of England and other countries in Europe and later to the rapidly developing factories of New England.

The invention of the cotton gin, by making easy the separation of cotton fibers from the seed, produced a rapid extension of cotton-planting in the south. As negroes were very useful in the cultivation of the cotton crop, there was a much increased demand also for slaves. The invention of the cotton gin therefore is given as the chief reason at this time for the rapid extension of slavery throughout the south.

The cotton gin, although a complete success at first, has been much improved in later times. Every plantation at first had a small cotton gin, but in later years the cotton has been collected from many plantations at central stations, where large improved cotton gins and great cotton presses can handle any amount of cotton at a small expense.

For more than a hundred years no very marked improvement was made in the harvesting of cotton. Picking cotton has always been tedious and has employed a large number of hands. During the cotton-picking season the fields of the south have employed men, women and children by thousands and tens of thousands. A quicker and cheaper method by machinery was much needed. In recent years various attempts have been made to devise a machine that would take the place of hand labor in picking cotton. A successful cotton-picker has now been invented and put into use, so this important labor is being gradually taken out of the hands of the negro, and he must learn to make a living in some other way.

After the cotton has been ginned, another machine compresses it into bales, which are tightly bound with iron strips. It is now ready to be shipped by rail or by ocean steamer to New England, Canada or to distant lands to supply the machinery of great mills with the raw material for weaving many kinds of cotton fabrics.

3. In the manufacture of cotton goods there has been developed a series of most ingenious machines for carding, spinning, weaving and dying the cloths. Some of the most

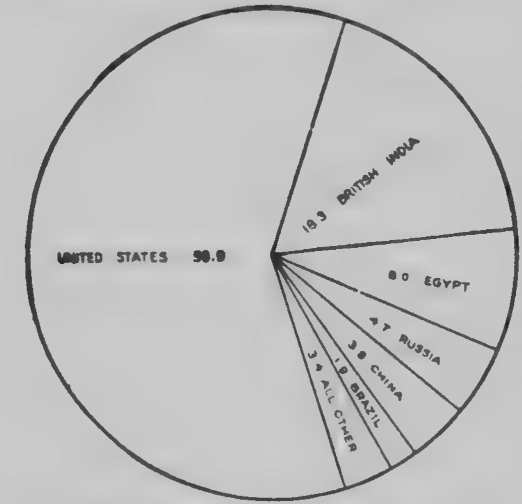
remarkable inventions devised by men have been worked out by skilled machinists who were struggling with the difficulties of working over the cotton fibers. Chief among these inventions are the spinning mule and the power loom.

The process of spinning was once performed with the old-fashioned spinning wheel, by which the delicate fibers of cotton are drawn out and twisted into thread. Instead of one thread slowly drawn out and twisted by hand, now, by means of the spinning mule, hundreds of threads are drawn and twisted by a single workman. The spinning mule is a combination of ingenious devices gradually brought to perfection by hundreds of inventive minds engaged in cotton-manufacturing.

COTTON FLOWER AND BOLL

Preceding the spinning is a series of remarkable machines, the cleaners, the carders and drawing frames, by means of which the tangled fibers are cleaned, combed and straightened and then shaped into uniform strands ready for the weaving. The fleecy strands or slivers, as they are called, are taken up by the spinning machines, drawn out and twisted into thread which are rolled upon spools ready for the looms. The cleaning, carding, drawing and spinning machinery makes a whole series of complicated processes whose sole purpose is to produce the threads or yarn out of which cloth is woven. Great factory buildings are devoted to this thread-making process.

4. In order to weave cloth rapidly and in large quantities it was necessary to improve upon the old hand loom, the shuttle of which was thrown by hand and the harness for shifting the threads was moved by a foot-treadle. In 1783–85 the power loom was invented and brought into use in England. This loom can be run either by water or by steam power, but its general introduction was dependent upon the invention of the steam engine. In the power loom the shuttles move back and forth in the weaving process with lightning speed, and the woven product is far greater. In a single mill sometimes several thousands of these looms are at work, and the number of yards of cloth turned out is enormous. The looms have been improved by new inventions and devices till now the self-acting automatic loom has reached a high perfection in weaving. It can even pick up broken threads and does not require skilled workmen to manage it successfully.



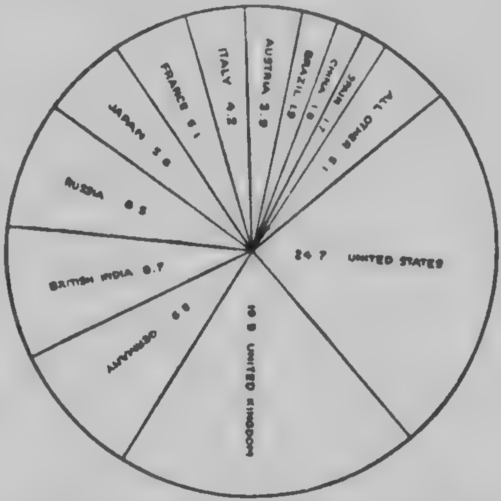
PROPORTION OF WORLD'S SUPPLY OF COTTON CONTRIBUTED BY EACH COUNTRY

In our modern factories the importance of a mill is expressed in the number of its spindles and looms. For example we say that in the southern states in 1902 there were 6,250,000 spindles and 130,000 looms in use.

5. The various machines used in the process of spinning and weaving made it necessary to combine all these processes

in great manufacturing plants. If the raw cotton is to be converted into finished cloth in one factory, the machines and processes of cleaning, carding, spinning, weaving and dying must be combined in one related series. As soon as one machine and set of workmen complete their part, the next machine and group must take it and carry it one step further, and so on through one continuous series of processes and machines till the finished cloth appears.

It requires a high degree of ingenuity and administrative ability to organize one of these large mills and cause all the parts to work together steadily in the production of cloth.



PROPORTION OF TOTAL CONSUMPTION OF THE WORLD'S COTTON SUPPLY—FROM CENSUS REPORT, 1911

This kind of manufacturing could no longer be carried on in cottages and by hand as formerly. Instead of this, expensive buildings and machinery must be brought together, and hundreds of thousands of workmen or operatives are required to direct the machines and processes. The result has been that the cotton-manufacture is now carried on in cities where large numbers of operatives can be depended upon, and millions of capital are invested in engines, machines and buildings. This has involved also the management of hundreds and thousands of skilled and unskilled workmen, including men, women and children in a single plant.

6. In developing the cotton industry also it has been necessary to select those regions of the world best adapted to the cultivation and later to the manufacture of cotton cloth. In the southern and gulf states south of 35° north latitude have been found the soil and climatic conditions (temperature and moisture) favorable for cotton cultivation. In consequence about three-fifths of all the cotton produced in the world is raised in this part of our country. As high as 10,000,000 bales, each of 500 pounds, have been raised in one year. It has been estimated that the United States when developed to its full capacity can produce 50,000,000 bales in a year without encroaching upon other crops.

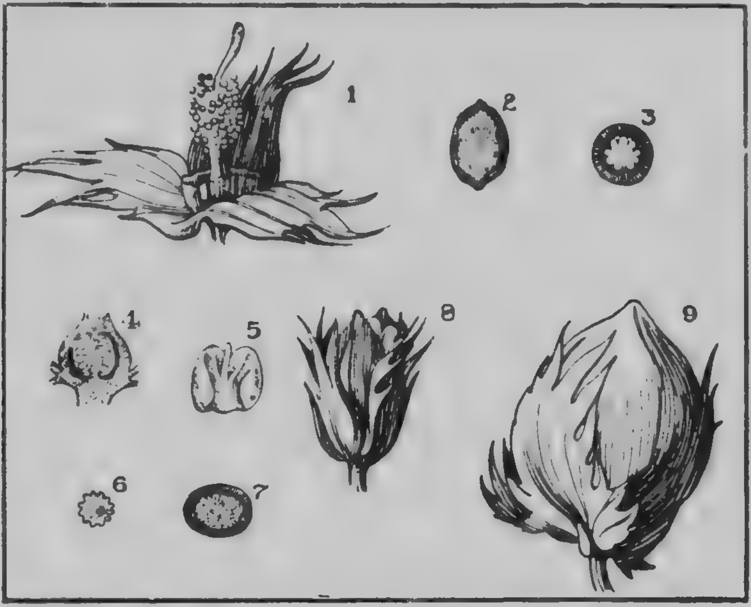
It was equally important to find localities favorable by climatic conditions of moisture and temperature for spinning and weaving. The region about Manchester, England, was found to be peculiarly favorable to cotton-manufacture because of its moist atmosphere and nearness to the ocean. Equally necessary were the capital and mechanical ingenuity in building up the large manufacturing plants.

In New England, also, at Fall River, Lowell and other cities not far from the coast, were found not only the climatic conditions favorable, but also extensive water power serviceable for the machinery of the mills. For many years, till about 1880, New England was the important center for cotton-manufacture in the United States.

Later it became evident that cotton factories established in the southern states would bring about a large economy by saving the expense of thousands of miles of shipment to New England or to Europe. Along the outskirts of the southern Appalachians abundant water power is also supplied by the rivers of that section.

During the last thirty years men have profited by these peculiar advantages of the South and have steadily increased the factories in the region till now nearly as much cotton is spun and woven in the South as in the North. In the Carolinas, Georgia and Louisiana factory towns have grown up and the cheaper grades of cotton goods are made, not only for the South, but for China and other foreign lands. Of the total crop of American cotton about one-third is now manufactured in the United States and two-thirds in Europe, mostly in England, Germany, Belgium, Holland and France.

7. In the development of the cotton industry, one of the large problems to be worked out has been the improvement of transportation. The application of steam power to locomotives on railroads and to steam-propelled vessels on the ocean and on rivers has made possible the shipment of millions of bales of cotton to distant markets. The old modes of traffic on land and water could not have provided for such extensive shipments.



PARTS OF COTTON FLOWER

1. Flower with calyx and corolla removed. 2. Longitudinal section of fruit. 3. Cross-section of ovary. 4. Longitudinal section of ovary. 5. Embryo, enlarged. 6. Pollen grain, enlarged. 7. Cross-section of seed. 8. Seed-pod splitting at the top. 9. Unopened boll.

Again, the harbors of seaports and entrances of rivers have required improvement by dredging and by jetties to provide for this trade, as at New Orleans, Mobile, Galveston, Savannah and Charleston. The hydraulic cotton press by which the soft, loose cotton from the gin was compressed into solid heavy bales for shipment has been very serviceable. Finally, the shipment of cotton cloth to all the countries of the world by these improved means of transportation has opened up a world market for American cotton. Cotton is the most important and valuable product shipped by America to other countries, in exchange for their peculiar products.

8. About twenty-five years ago it was discovered that the seed and stalks of the cotton plant were of much value as well as the cotton fibers. The problem of discovering the value of these by-products of the cotton plant has been worked out with great advantage to the cotton farmers.

About two-thirds of the weight of cotton picked from the field is in the seed. Machines have been invented for hulling the seeds and pressing out and purifying the oil. A ton of seed yields 300 pounds of oil, 700 pounds of oil cake and 890 pounds of hulls. A mixed food of oil cake and hulls has proved to furnish a well-balanced ration for cattle and dairy cows. The cotton meal is also an excellent fertilizer. The oil is used for salads, also as a lubricating oil and with kerosene for lighting and for soap-making. Formerly the seed with these by-products was chiefly thrown away. In recent years the by-products from the cotton seed have amounted to about one-fourth of the total value of the cotton crop, or $80,000,000 in one year. In addition to this we may observe that the stalks have been found useful, but perhaps the best use is to plow them under, let them rot and thus help to fertilize the soil.

9. Other vegetable fibers besides cotton are used in cloth-making, especially flax and hemp.

Flax, from whose fibers linen cloth is made, has been used longer than cotton. It is often mentioned in the Bible, and the ancient Egyptians wrapped the mummies in linen cloth. The flax fibers are much longer and stronger than those of cotton and are preferred for toweling, tablecloths, collars and cuffs, handkerchiefs, laces, strong thread and fishing linens, and for linen dresses and skirts. The linen fibers are taken from the inner bark of the flax plant, the woody portions having been rotted off and removed.

Flax is chiefly produced in certain countries of Europe, especially in Russia and Ireland. The fields of central Russia are largely given to the raising of flax, and great quantities of flax fibers are shipped to other manufacturing countries to the mills. From the factories of Europe fine manufactured linens are shipped to all parts of the world. In the north of Ireland are large linen mills which have long been famous for the fine qualities of linen they produce. Many of the fine laces of Belgium, France and Holland, which are imported to the Dominion, are made from Russian flax.

The Dominion produces considerable flax, not for the fibers, but for the flax seed, which is pressed for oil, linseed oil being much used in paints, oilcloths, etc.

The processes of spinning and weaving are like those in cotton goods, and the inventions of machines for spinning and weaving cloth are essentially the same for all kinds of vegetable fibers.

10. Another plant that produces a most important fiber is the hemp. The chief source of hemp fibers is the abaca or hemp plant which grows abundantly in the Philippines. It is a tree-like plant much like the banana, growing twenty or more feet high, but like the banana, its central stalk is surrounded with leaves. The soft inside leaves contain the hemp fibers, which must be separated from the soft pulp of the leaves.

These long, stout fibers are collected in bundles and shipped to other countries for the manufacture of ropes, twine, hammocks, canvas, carpets, hats and a great variety of goods. These fibers are mixed with other fibers to make hats, veils, curtains and cloth. Mixed with silk, hemp produces delicate crepes and veils.

A different kind of hemp is produced chiefly in the bluegrass region of Kentucky. The inner fibers of this tall plant are used for making thread, rope, sail cloth and homespun goods. It is treated much like flax and is of great importance in the trade.

Several other vegetable fibers found in different parts of the world may be studied and compared with flax, hemp and cotton. Among these are the ramie, which is much like hemp and is chiefly grown in China. In India the jute plant, very similar to flax, is used for making coarse bagging, also rugs and carpets. These fibers are also mixed with cotton, flax or silk for making cheaper grades of cloth. The coarse bagging used in baling cotton in the south was chiefly made of jute from India.

11. Of almost equal importance with cotton and other vegetable fibers mentioned is the use of wool for the manufacture of cloth and clothing. Wool is an animal fiber obtained from the backs of sheep, goats and other animals. It has been used for the spinning and weaving of cloth from the most ancient times. The processes of spinning and weaving have been nearly the same in cotton and wool. The great inventions have had the same effect in both cases. Woolen cloth is warmer and it is also more durable and expensive. In many kinds of cloth cotton and woolen fibers are mixed.

Europe is the chief centre of wool-production and manufacture for the world, but wool is produced extensively also in the United States and in Asia, and the three great wool-growing regions of the southern hemisphere are Australia, South Africa and the plains of the La Plata in South America. Canada has ample resources for the production of wool, but these are being developed slowly. The transportation of wool from the wool-growing countries to the manufacturing centres is, like the transportation of cotton, one of the most important items of ocean traffic. Great steamship lines are employed chiefly in this transport.

A comparison of the location of the great cotton-growing districts of the world with the wool-producing countries will show that wool is grown farther north or south of the equator than cotton. Cotton also is chiefly used for clothing in warmer lands, while wool is more extensively used in colder regions.

12. A third important material used in making cloth is silk, which is obtained from the cocoons of the silk worm.

In China, Japan and India silk goods are turned out in large quantities. The old-fashioned hand looms are still in use in these eastern lands.

In Italy and France raw silk and the finest silk goods are made in vast amount and shipped out over the world.

Paterson, New Jersey, and New England in the United States are now producing immense quantities of silk goods. The processes of spinning and weaving in the large mills are similar to those of cotton and wool.

The production of cotton, woolen and silk goods in many parts of the world constitutes the chief part of what is called our textile industries.

13. There are also two other important ways of manufacturing these fibers into clothing, known as knitting and lace-making. In modern times knitting and lace-making machines have been invented which are almost as ingenious and important as the spinning and weaving machines. Great factories in America are also employed in knitting and lace-making.

In a little more than a hundred years the remarkable inventions already described in the various textile industries have vastly increased the quantity of goods and greatly reduced the price of them for the people. The common people are thus enabled to clothe themselves more comfortably and attractively than in former times.

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Industrial Evolution of the United States. Wright. Scribners.
Geography of Commerce. Trotter. Macmillan.

53. Type Study on the Coffee Plantation

Suggestions as to Method

(*a*) The study of coffee, tea and chocolate, as to countries in which they are produced, the regions of the world in which they are used and the traffic routes by which the exchanges are made involves a good share of the lands and seas of the whole earth.

(*b*) This study involves a treatment especially of tropical and subtropical lands and islands in both hemispheres and on both sides of the equator. The great belt of equatorial and semitropical lands and seas comes under this study.

(*c*) A series of pictures is needed showing not only coffee and tea plantations with their orchards, buildings and processes of cultivation and treatment of products, but also the trees and vegetation peculiar to the warmer lands.

(*d*) Incidental to this study of productions comes a study of the peoples of these warm countries, and their dress, customs and modes of life.

(*e*) Specific drills are desirable in the naming and location of countries, islands, cities, seas and ocean routes.

(*f*) We have now excellent supplementary readers which give a fuller and richer treatment of these topics than can be presented in this text, with excellent maps and pictures.

(*g*) The comparisons of the regions devoted to tea, coffee and chocolate and of all the processes of preparation of products should be regularly encouraged.

Outline of Topics

1. Where we get our coffee.
2. A coffee plantation in Brazil.
3. Planting and growth of coffee trees.
4. Gathering the coffee berries.
5. Processes of removing the coverings of the seeds.
6. The coffee market at Rio Janeiro and at Santos.
7. The countries where coffee is produced

8. Coffee-using countries.
9. Tea-production and use throughout the world.
10. Chocolate. Regions where it is produced and raised.
11. General summary regarding these three products of the warmer zone.

A COFFEE PLANTATION

1. Nothing that we eat or drink is more common on our breakfast table than coffee. Many people have such a habit of drinking coffee that they would scarcely know how to breakfast or dine without it. But coffee comes a long distance across land and sea and usually from beyond the equator before reaching our breakfast table. The people who raise coffee for the market speak a different language from ours. They live and dress differently from us, and they would not feel at home at our breakfast table, even where their coffee is served.

Should we travel back over the same route by which coffee has made its way from the coffee plantation to our homes, we should find the journey a long and changing one. It would bring us by railroad to Montreal or Vancouver and by steamship travel to Porto Rico or to Rio Janeiro, S. A., and from there two or three hundred miles up into the warm hill country of Brazil. We would travel through tropical forests, palms and banana groves, and up steep mountain roads into what might be called the backwoods of Brazil.

2. A coffee plantation in southwestern Brazil is much larger than our Ontario farms. The largest plantations cover several thousand acres and are as extensive as some of our big western cattle ranches.

In the upland, hilly and mountainous parts of Brazil, southwest of Rio Janeiro, there are many of these great coffee plantations, which are owned and managed by wealthy proprietors.

Such a plantation is so large that it is like a small country or empire ruled and managed by a company. Sometimes the estate is owned by one man. An owner often employs several thousand people upon a single plantation. At some convenient place on the estate he will have large buildings both for dwellings and for the extensive machinery required, long low sheds connected with broad cemented areas where the coffee berries can be dried in the sun and protected from rain and heavy dews. There are also scores of cottages for the working people and families. There are also large barns and storage places for the machines used on the plantation. There is usually a carpenter shop and a blacksmith shop, a sawmill and a brick kiln. Often a sugar-cane mill and a mill for grinding corn are found on the plantation. For all these are needed to produce lumber, brick and food materials required by many hundreds of people. It is necessary also to have a large store where laborers and their families can buy the many articles of food and clothing not produced on the plantation. Roads must be built in all directions over the farm, and sometimes tracks are laid for private railroads over which the coffee is hauled and collected at a central station.

The manager of such a large coffee estate has his hands full in overseeing so many people, with such a variety of shops, machines, storehouses and separate fields.

Besides others, he needs a large number of clerks and bookkeepers to secure a close and accurate account of the whole business. Formerly negro slaves did the common work on the plantations, but slavery was abolished in Brazil some years ago and now Italians are sometimes employed instead. But negroes are also numerous as laborers on the plantations.

3. Getting a large coffee plantation started is costly and laborious. The heavy growth of trees and brush has to be cut away and burned. As soon as the ground has been cleared we find a very red soil, about the color of dark red brick dust, which is very rich and favorable to the growth of the young sprouts and trees of the coffee plant. The coffee seeds are first planted in nurseries and when about a foot or more high are transplanted to the hillsides where

they are carefully cultivated, weeds pulled out and the ground plowed. Between the rows, the first year or two, corn and other crops are raised. In four years the trees grow to a height of six feet, and in the fifth and sixth years they begin to yield good crops, three or four pounds of coffee to a tree. Such a field may continue to bear for thirty years and longer. The coffee trees gradually exhaust the soil, so that in planting new fields, new forests are cut down and new and virgin soil secured. The old fields are often abandoned, and much of the coffee country looks deserted and waste.

LEAVES AND FLOWERS OF THE COFFEE PLANT

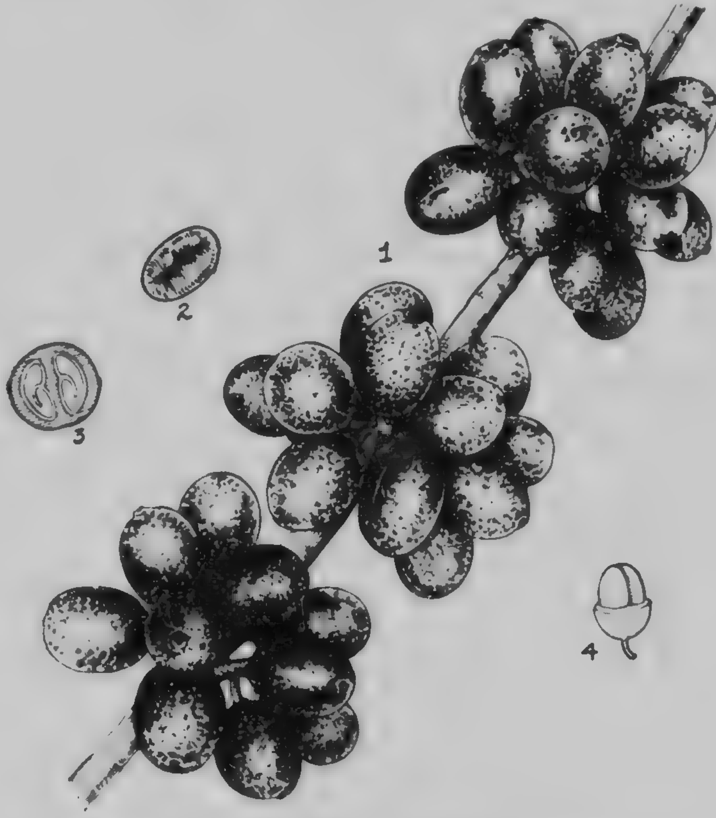
The coffee plantations require a warm, moist climate where no frosts occur, but not too warm and not a scorching sun. This favorable climate is secured in the Province of Sao Paulo, where the hillsides furnish the right combination of warmth, moisture and soil. These hilly lands lie from one to three thousand feet above sea level in the semitropical belt of Brazil.

4. The time for gathering the coffee is in April and May. The red berries grow in clusters close to the branches and are about the size and color of a dark red cherry, or somewhat larger than cranberries.

When the crop is ready to harvest, the pickers by thousands go out into the coffee groves to pick the berries. Men, women and children gather them in baskets and carts, and cars collect the results of the pickers' work and haul them to the mills. A single picker working from sunrise to sunset may gather enough to make fifty pounds of hulled coffee. On a single plantation there may be 5,000 pickers at work. The largest coffee plantation in Brazil has about five million trees. On such a plantation there are many coffee orchards in all stages of development, from the freshly planted trees to old orchards twenty feet high. New groves are set out each year. On the largest plantations the berries are collected and hauled in to a central station from all parts of the plantation by engines and trains of cars.

5. The coffee berry has three coverings, the fleshy outside pulp, and two inside, close-fitting skins. The outside fleshy covering is crushed and softened by passing between rollers and then is easily removed by whirling and churning it in water. The heavier seeds drop through small holes in the revolving cylinders and are collected. They are then subjected to a scouring and rubbing which leaves them smooth white berries with nothing but the two inner coverings. These white berries are spread out on broad cemented areas and exposed for many days to the hot sun till they are thoroughly dry. During this period of about sixty days, they are raked and rolled, shoveled together and spread out again so as to expose them thoroughly to the sun. They must be covered and protected against rains and dews. It is a long and laborious process of drying.

An improved modern method used on some large plantations requires steam heat. This artificial process of quick drying requires only a few hours and does not expose the coffee to the danger of rains and dews. It demands somewhat expensive heating and machinery, but it saves time, requires far less labor and somewhat improves the quality of the coffee. After the berries are thoroughly dried they are passed through a series of machines which crack and



COFFEE BERRIES AS THEY GROW
1. Clusters of berries. 2. Ripened berries. 3. Cross-section of fruit. 4. Fruit cut to show the berries

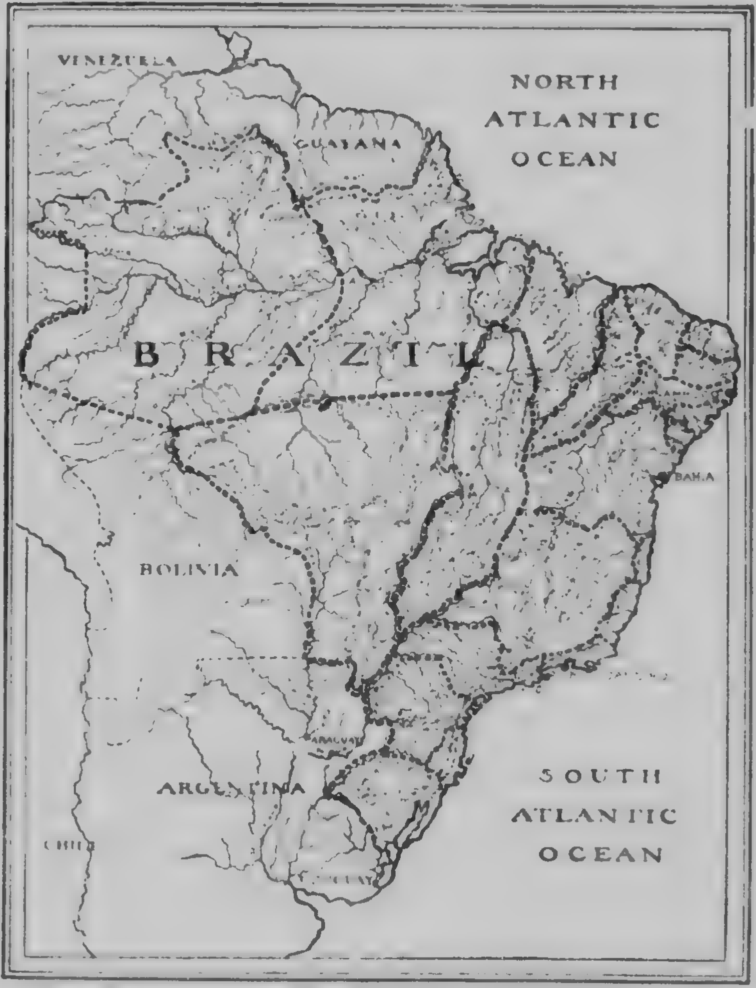
loosen the thick parchment cover so that it can be shelled off, and after that the delicate inner lining called the silver coat is loosened and blown away by a fan. The inner bean consists usually of two coffee kernels with their flat sides together. The mill machinery for separating the coffee kernels from the two inner covers is complicated and hard to describe.

The green coffee kernels, when properly sorted according to size and quality, are shoveled into sacks and shipped to the markets.

6. The Brazil coffee in sacks, weighing each 132 pounds, is loaded upon trains for the two chief points of export, Rio Janeiro and Santos Along the wharves at Rio Janeiro are great warehouses and coffee factories where coffee is the main staple upon which the commerce of the city depends. All that section of the city is given up to the coffee business. The streets are full of wagons loading and unloading the coffee bags, which are piled up by thousands. In large rooms of the warehouses the coffee is also poured out and sorted and then shoveled into sacks. The noisy factories near by are at work hulling and cleaning the coffee berries which are not ready for shipment. In the harbor lie ships from many parts of the world loading with coffee. Twenty different lines of steamers carry cargoes of coffee to Baltimore and New York, to Liverpool and London, to Hamburg and Lisbon, and to many other cities. Hundreds of negro workers run back and forth to the ships carrying the heavy coffee sacks. Other ships are loaded by cranes which lift a whole batch of coffee sacks at once.

This is probably the greatest coffee market in the world. The air is filled with the odor of coffee and the people and merchants are talking most of all about the qualities and prices of coffee. Ships from foreign lands bring to Rio Janeiro many kinds of goods used by the planters and other Brazilians in exchange for coffee, as lumber from Maine, codfish from the Newfoundland Banks, rice from India, cotton goods and machines from England. It is this trade which has caused

Rio to grow into a great city. The city of Santos, the port of Sao Paulo, is about equally important with Rio Janeiro for the coffee trade and has many ship lines to foreign parts.



THE LEADING COFFEE-PRODUCING COUNTRY OF THE WORLD

7. The coffee-producing countries of South America are not limited to one province of Brazil. Nearly all parts of

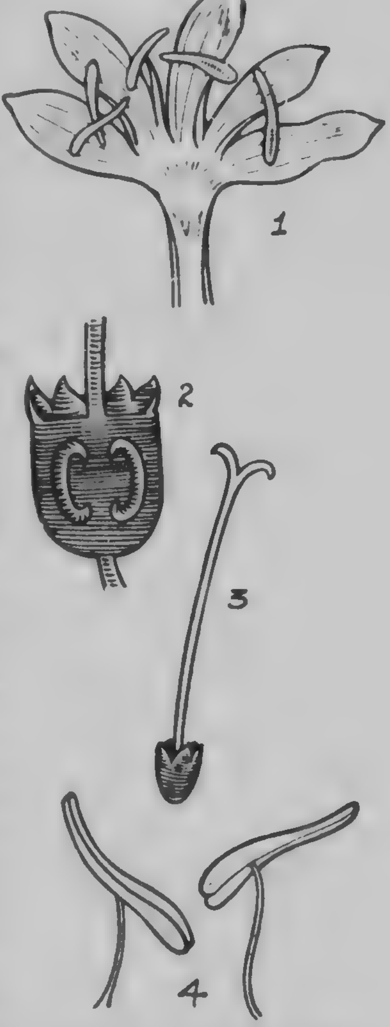
Brazil, even the hot regions of the Amazon, produce coffee, but in different ways according to climate. In Venezuela there is extensive production of coffee of a superior quality On account of the intense heat in Venezuela the young coffee trees are protected under the shade of bananas and other quick-growing trees, which rise above the coffee bushes and shelter them from the sun. The coffee of Venezuela is also shipped to Europe and America and sold as of the best quality, even as a substitute for Mocha. Besides Venezuela, Colombia and Peru are important coffee-producing states of South America.

The West Indies, Mexico and Central America produce a large amount of coffee for the general world market. On the hills and mountain slopes of Cuba, Haiti, Jamaica and Porto Rico coffee plantations are numerous. At one time Jamaica produced a large amount of coffee, of a superior quality. All the Central American countries are adapted to coffee production, and they with Mexico supply for export yearly about two hundred million pounds.

The South American states which lie on both sides of the equator and those parts of North America and the West Indies which lie in the subtropics are the great centers of coffee-production for the world. Out of the 2,300,000,000-pound coffee crop of the world, about 2,100,000,000 are produced in the tropical and subtropical regions of the Americas.

The other chief centers of coffee culture are Ceylon, Sumatra, Java and other East Indian Islands, Madagascar and other islands of the Indian Ocean, North Australia, and some of the warm parts of Africa. Abyssinia is supposed to have been the original home of the coffee plant, and Arabia, near by, for a long time produced the finest quality of coffee, known as Mocha. A study of the world map will show that the home of coffee is in the tropical and subtropical countries of the world. While Brazil is at present the great producer beyond all other countries combined, it is probable that in the future many other warm countries in Africa and both the Indies will greatly increase their product and thus compete with Brazil in the world market.

8. Coffee is, of course, extensively used in Brazil and other countries where it is produced, but it is sent in shiploads to colder countries, and especially to the United States. The United States, by the acquisition of Porto Rico, the Hawaiian Islands and the Philippines, now possesses territories where coffee of good quality is produced for the market. Coffee is not grown to any large extent in North America, except in Mexico. It is really a tropical tree, which looks like a small cherry tree. Canadians use each year about 12,000,000 pounds of coffee, an average of nearly two pounds per capita, whereas the average in the United States is twelve pounds a year. The European nations are also large consumers of coffee, especially the Germans, and in a less degree the English, Dutch and Austrians. In Germany it is often adulterated by grinding it up with chicory root, which is much cheaper. Some perhaps prefer the mixture



PARTS OF THE COFFEE FLOWER
1. Longitudinal section. 2. Longitudinal section of ovary and calyx. 3. Pistil. 4. Stamens

9. Next to coffee the most important drink at our tables is tea. It has been used as the common drink in China and Japan for hundreds of years, and today these are the two chief tea-drinking nations. They consume yearly about two billion pounds more than all the rest of the world together

In the last hundred years tea has been extensively cultivated and exported from India, Java and Ceylon. It is shipped in swift steamers to Europe and to the English colonies over the world. Among the white races, the English in Great Britain and her colonies are the principal tea drinkers. It is evident, therefore, that tea is produced almost entirely in eastern countries, in subtropical and in the warmer temperate regions. As compared with coffee it is not so widely cultivated throughout the warmer regions, but it is cultivated farther north than coffee. A successful tea plantation has been carried on in South Carolina.

In China and Japan the tea gardens are small but very numerous, so that they cover whole regions. In India and Ceylon there are large plantations employing hundreds and even thousands of pickers on a single estate.

The tea plant is a bush that grows to a height of fifteen or twenty feet, but is kept closely pruned so that it does not stand more than five or six feet high. The young plants are put in rows in a rich soil and carefully cultivated, and begin to be picked of their leaves when three years old. The young green leaves are picked three or four times a year and the first pickings are the best. The tea commonly used is made from the young and tender leaves and buds, which are picked, dried and rolled either by hand or in machines. When thus rolled up the leaves look like little green worms. The leaves are then roasted in pans either in ovens or by a hot blast. When thus fully prepared and the stems picked out, the tea is packed in boxes lined with thin sheets of lead to protect it from the sea dampness in ocean shipments. This salt sea dampness easily destroys the quality of the tea. The finest qualities of tea are produced in China and Japan, where tea-drinking is a marked national custom.

In comparing tea and coffee production, we notice that the great centres of cultivation for tea are in eastern lands, as China, Japan and India, while the centres of coffee production are in the western hemisphere, in South America and the West Indies, Mexico and Central America. It is, however, curious to note that Java, Ceylon and India are remarkable for the production of both tea and coffee.

10. A third important drink, which has grown in popularity throughout the world in modern times, is chocolate. Like tea and coffee it is a tree product yielded by the cacao tree of tropical lands. It is a native of Mexico and Central America and is raised in groves which are protected from the heat by loftier trees. The numerous berries grow in large oblong pods, which may contain as high as thirty or forty seeds. These pods grow close to the trunk and branches of the trees, and are clipped off by knives fastened to the end of long poles. Each of the beans has a hard shell that has to be cracked and separated from the kernel. This inner kernel is then ground up, most of the oil pressed out of it and then molded into flat cakes, wrapped and shipped. The oil is called butter. Chocolate is not only a refreshing drink, but has also nutritive qualities which make it more of a food than either tea or coffee.

At the time of the discovery of America, it was a favorite drink with people of Mexico and Peru, especially among the higher classes and in the palace of the Montezumas. The chocolate berries were esteemed of great value. The Spaniards introduced it into Spain, and for a while its proper preparation was known only to them. In more recent times it has come into common use as a delicious drink in Germany, England, Holland, France, etc.

The pure chocolate is mixed with sugar to make sweet chocolate, and is used with vanilla flavoring and in the manufacture of choice candies, cakes and other confections.

On account of the growing demand for chocolate, its cultivation has been extended to the tropical parts of Africa, to the East Indies, Java and the Philippines and to islands of the Pacific, as Samoa and Hawaii.

11. The three most popular beverages for table use throughout the world are coffee, tea and chocolate. They all came originally from tropical countries and are still chiefly produced in the warmer lands. But their common use has extended far and wide throughout the temperate and colder regions of the world. This has given rise to an immense traffic, chiefly by the great sea routes, and carried on by a large number of steamship lines. The tea trade in Asia involves also important caravan routes between China and Russia.

These three products are good illustrations of the natural interchanges between the colder and warmer parts of the world, due to natural differences in production. The colder countries send into the warmer lands many manufactured articles in exchange for coffee, tea and chocolate.

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54. Type Study on Irrigation in the Northwest.

Suggestions as to Method

(*a*) Irrigation on a large scale, under private control, is the main idea developed in this topic. This is a method of improvement which is rapidly developing at the present time, and is supplanting the smaller private projects which have been in operation during the last twenty years.

(*b*) A full description of one of these great projects, illustrated with diagrams and pictures, will plainly demonstrate the principles upon which these large irrigation schemes are worked out.

(*c*) The government reports and the advertising circulars of western cities, railroads and land companies furnish excellent maps and pictures.

(*d*) A full comprehension of one of these schemes requires a vivid exercise of the imagination in constructing the whole plan upon which the dam and ditches are based, so as to deliver the required water to the land.

(*e*) A great variety of irrigation methods is employed and a comparison of these various plans as to efficiency and results requires a vigorous process of thinking

(*f*) Drill upon the important series of rivers, provinces, cities dependent upon irrigation, lakes and irrigation districts, till they are well fixed in memory.

(*g*) Let the children study the maps thoroughly and learn to sketch the projects and irrigation districts

(*h*) On the basis of the outline of topics let the pupils give full oral reproduction without help from the teacher's questions

Outline of Topics

1. The need for irrigation.
2. The law regarding irrigation.
3. Rivers flowing east and west from the Rocky Mountains and furnishing water for irrigation. The Rocky Mountains as sources of water supply.
4. Extent of private irrigation schemes.
5. The Bow River Valley project.
6. Various phases of the project. The main intake. The Bow River dam. The canals and ditches. The productive land.
7. Other projects in Alberta and Saskatchewan.
8. Plans with regard to actual settlers. "Ready-made farms." Loans to settlers.
9. The wealth of the arid sections.
10. Great possibilities of irrigation.
11. Irrigation in other lands.

IRRIGATION IN THE NORTHWEST

1. In recent years there have been undertaken a number of great projects for irrigating large tracts of arid land in the west. During the last twenty years many irrigating

ditches have been dug along the rivers of the dry sections by farmers and by several small companies. In this way small areas of land in the western provinces have been supplied with water. Especially in southern Alberta and Saskatchewan, irrigation has been practiced ever since these districts were first settled, but the tracts under irrigation were small and the works were crude and temporary. There was no concerted attempt to irrigate a large section; each settler secured only enough water for a few acres of garden or hay land. If a man could not get as much as he needed he took what he could get. There was no attempt to regulate the flow of water or to apportion it among the settlers. Their needs were small, because cattle ranching was their main occupation and the cattle could roam to find water.

As the population of southern Alberta and southwestern Saskatchewan near the Cypress Hills increased, two serious problems were presented for solution. One was the insufficient supply of water, the other was its unequal distribution and the consequent conflict of water rights. The cattle rancher needed little water, but the rapidly growing percentage which was turning to farming needed more than it could get. The first-comers had the water and the late-comers had no rights. For many years there was confusion and conflict and little satisfaction for anybody. No records were kept and there was no attempt at control.

Such a situation was intolerable. There were thousands of acres of rich land, which needed only water to be among the richest farming districts of the world; there was an increasing population which wanted to farm; and there was a demand for the products which could be raised. The old idea, that the Canadian Northwest was barren, was quickly superseded by the knowledge that it was fertile. The first remedy applied was a law called the "Northwest Irrigation Act," an act governing the administration of irrigation in Saskatchewan and Alberta. This law was passed by the Dominion Parliament in 1894 and has been amended several times, but its essential features are still the same

2. The law as now existing is believed to embody the best principles of the irrigation laws of other countries in so far as these are applicable to conditions in Canada. It asserts certain fundamental principles which are the basis of irrigation everywhere. These are stated briefly as follows:

First. That the water in all surface sources of supply is the property of the Dominion government.

Second. That the right to use this water may be granted to individuals or companies upon compliance with the law.

Third. That the uses for which water rights may be acquired are:

(a) Domestic, which includes household and sanitary purposes, watering of stock and the operation of farm machinery by steam.

(b) Industrial, the operation of railways and factories by steam.

(c) Irrigation.

(d) Other purposes.

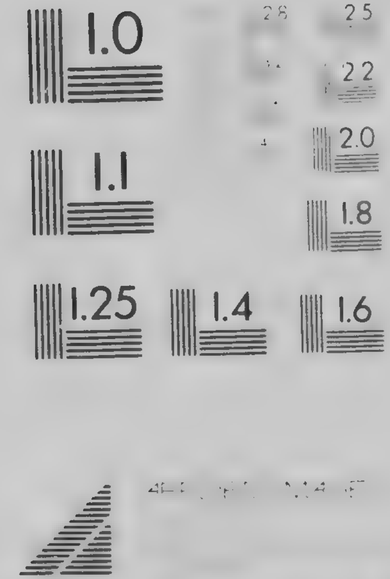
Fourth. That a clear and indisputable title to such rights should continue so long as the water is applied to beneficial use.

Fifth. That such rights may be forfeited by abandonment, waste or non-use.

Sixth. That the holders of water rights shall have the assistance and protection of permanent government officials, and that all disputes and complaints shall be referred to and settled by such officials, whose decisions shall be final.

The law gives further details as to the necessary surveys, plans, applications and works before the water right is formally transferred from the government to the individual. Each applicant is required to file with the Commissioner of Irrigation a statement showing the sources of water supply, the point of diversion, the character of the works to be built and the section to be irrigated. The applicant must own or control the land he proposes to irrigate, or he must enter into an agreement prescribed by the government for the supply of water to lands not owned by him. After the works have

MICROCOPY RESOLUTION TEST CHART



been completed and accepted by the government's engineers, the Commissioner of Irrigation issues a license authorizing the diversion of sufficient water to irrigate the land shown on the plan. Once granted, a water right is inalienable except for just cause, such as neglect, waste or damage to other settlers. Each owner of such rights is entitled to receive the whole of the supply called for by his license before any later applicant receives a supply.

A corporation may acquire a license on the same terms as an individual. It must file an annual return showing its operations, including statements of receipts and expenses, mileage of canals and acreage under irrigation. Its articles of incorporation must likewise be approved by the Minister of the Interior before it may begin operations.

3. The Bow River, a tributary of the South Saskatchewan, is the most important of the irrigation streams whose waters, led out upon arid lands, render them productive. Among the smaller streams which furnish water in southern Alberta and Saskatchewan are the Belly and St. Mary rivers and Swift Current Creek. The Milk, the Souris and the Qu'Appelle, farther south, are also used to some extent for irrigation. The valleys of these rivers vary from a few yards to thirty or forty miles in width, broad belts which offer riches to the farmer.

This irrigable section in Alberta and Saskatchewan is really a part of the great plains which extend southward through the United States. There is thus a strip of land just east of the Rocky Mountains, extending as far as Texas, about 1,200 miles in length, which has been extensively irrigated. More ditches are constantly being built, and more land is being brought under irrigation. The water needed was at first secured without great difficulty, but it was soon found that more elaborate engineering projects were necessary to ensure a water supply at all seasons. For this purpose great dams, such as the Horseshoe Bend Dam at Bassano, eighty-three miles east of Calgary, and large reservoirs, such as Lake McGregor, were constructed. In parts of the United

States, similar dams have been built high up in the mountain valleys and narrow gorges.

The whole Rocky Mountain range, from Mexico almost to the northern end, rises very high, so as to catch and pile up on the upper slopes the heavy snows of winter. There is, therefore, with the melting snows and floods of springtime an immense amount of water that can be stored in artificial reservoirs and then let out upon the fields in summer. Almost all irrigation in Alberta is made possible only through the rivers which are fed by the snows of the Rockies.

The westward slopes of the Rockies and the Selkirks have an even greater snowfall than the eastern. These snows feed the Fraser and the Columbia and their tributaries. The valleys in British Columbia furnish a second extensive field for large and successful irrigation projects. Examples of these are found in the Okanagan and Kootenay districts, both of which have become rich fruit-growing sections, as well as farming and stock-raising regions.

4. The result of the passing of the Northwest Irrigation Act in 1894 was the development of irrigated farming, particularly in the districts east of the cities of Calgary and Lethbridge. Unusually abundant rainfall for several consecutive years then encouraged the settlers in the belief that the climate was changing, and a few of the irrigation works were allowed to go to ruin. In recent years some of the ditches have been repaired. Even if no repairs have been made for years, it is the policy of the government not to cancel the license unless there are other applications Especially since 1905 there has been a notable development of irrigation in the Cypress Hills, between Moose Jaw and Medicine Hat. This district has many small streams, large enough to irrigate the valleys, but there has been no attempt to irrigate the higher lands. Many of the works have been substantially built and well laid out, and the results have been almost uniformly good. As the farmers learn by experience, their methods will improve.

The total number of small irrigation schemes in Alberta and Saskatchewan is now about 500. About half of this number are in full operation and include 60,000 acres. Some 200 new projects, now under construction, will provide irrigation for at least 75,000 acres more. Thus the small or private irrigation schemes include a total area of more than 135,000 acres.

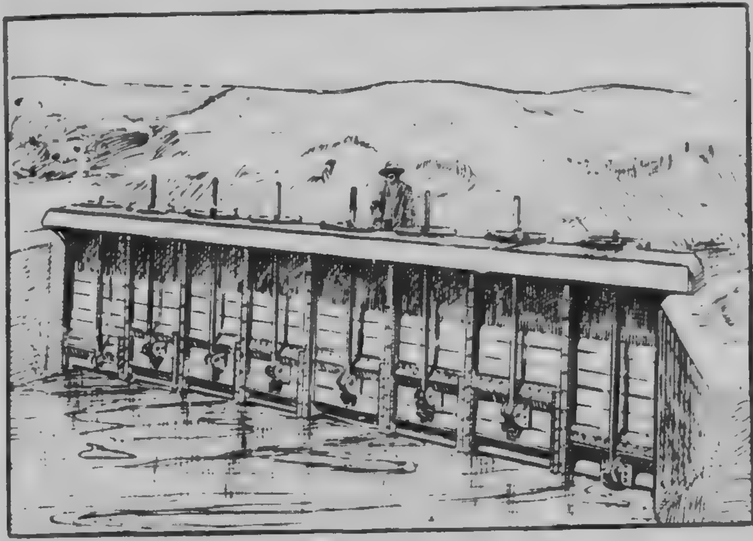
5. These many small projects sink into relative insignificance beside the great work which is being carried on by the Canadian Pacific Railway in the Bow River Valley. This is probably the best known and best advertised irrigation scheme of modern times. Between Medicine Hat and Calgary, mostly to the north of the railway line, a great tract of over 3,000,000 acres, about half of which is irrigable, is rapidly being brought under irrigation. This is known as the Bow River project. The soil is productive and easily worked, and would yield good crops four years out of five without irrigation; it needs a supply of water largely as a sort of crop insurance. This tract was withdrawn from sale in 1894 by the government and was later transferred to the railway company on condition that it undertake the construction of irrigation works. The tract has an average width of forty miles from north to south, and extends for 150 miles eastward from Calgary. Surveys in connection with the project were begun in 1903 and work has been continuous since that date. The results of the surveys showed that the tract naturally divided itself into three sections of nearly equal area. The western and eastern sections are independent units, but the central section will receive its water by an extension of the main canals of the western part.

6. The western section comprises an area of 1,039,000 acres, of which about one-half was actually under irrigation in 1912. Construction was begun in 1903, the canals were first opened in 1907, and the work was completed in 1910. Water for this section is taken from the Bow River within the city of Calgary near the eastern limits. The head works are of wood, well protected by a pile and timber wall along the river bank; these will be replaced by concrete structures

BOW RIVER AT CALGARY

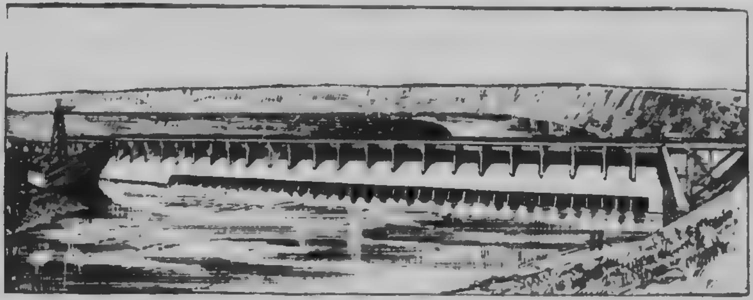
With Headgates of Irrigation Canal at Left

in 1914. The gates are of wood, of the straight lift type The main canal begins here and runs eastward 17 miles to a large reservoir. The width of the canal varies, the average being 44 feet at the bottom and 84 feet at the water line The reservoir, which is three miles long and half a mile wide, was formed by building an earth dam 2,000 feet long and 30 feet high. From this reservoir the water is taken out by three secondary canals, having a combined length of 250 miles. These, in turn, branch into hundreds of ditches. The total length of canals and ditches in the western section alone is over 1,600 miles, besides several hundred miles more constructed by the farmers. In building the headgates, flumes, etc., 10,000,000 board-feet of lumber and over 4,000 cubic yards of reinforced concrete were used. Little of the material needed for this work was found in the vicinity. As far as possible the dirt excavated was used to fill in whenever filling was needed; but rock, cement and timber had to be brought considerable distances. The dirt excavated, if piled 50 feet high and 50 feet wide, would form a wall over 20 miles long


A TYPICAL HEADGATE
With all but two sluices open

The central section, because of its altitude, can be irrigated only by an extension of the canals of the western part. It has an area of 901,000 acres, only 75,000 acres of which can be profitably irrigated. Work has not yet been commenced on this third.

The eastern third, however, is better suited to irrigation, and nearly one-half of it will be actually served by canals and ditches. The water is taken from the Bow River at Horseshoe Bend, about three miles southwest of Bassano, at a point where the watershed between the Bow and the Red Deer rivers for this section begins. A large dam has been built here, raising the level of water at the main intake and enabling the system to cover a large area by the removal of a small quantity of material from the main canal heading. The dam consists of an earthen embankment on the west side of the river, about 7,000 feet long, with a maximum height of 45 feet, and in the river channel a reinforced concrete spillway, 700 feet in length, which connects with the canal headgates There are canals leading to several large reservoirs, which have been built to hold the surplus water. The company has constructed secondary canals and also ditches to the boundary of each farm as small as 80 acres. The total length of canals and ditches in this section is about 2,500 miles. To leave the digging of distributing ditches to the individual farmers would have caused great delay, more expense and lower efficiency



HORSESHOE BEND DAM

7. Besides the Bow River project, the Canadian Pacific now owns a large tract southeast of Lethbridge, formerly the property of the Alberta Railway and Irrigation Company. This company was the pioneer in undertaking irrigation on a large scale in western Canada; construction was begun in 1900. At present 100,000 acres are irrigated by water from the Saint Mary River, and eventually the system will provide water for 350,000 acres. The main canal, whose headgates are near Cardston, Alberta, is 61 miles long; the Lethbridge branch 32 miles; and the Sterling branch 22 miles; a total of 115 miles. Smaller canals and distributing ditches bring the total to 250 miles.

Adjoining the Bow River project on the south is the tract of the Southern Alberta Land Company. For this project a canal was begun at a point on the Bow River about 35 miles east of Calgary and run in a southeasterly direction for 50 miles into Lake McGregor, an artificial reservoir covering 18,000 acres and holding 360,000 acre-feet of water. An acre-foot of water, it should be explained, covers an acre to a depth of one foot. From the sonthern end of the reservoir the main canal runs east to the lands under irrigation.

8. It is the policy of the land companies everywhere to make success sure for settlers. The Canadian Pacific, for example, has immigration agents in the large cities of the United States and Europe. The government agents give immigrants every possible assistance. After a settler has bought his farm and lives on it, he still has help from the company, for he need not at once pay for his farm. He pays one-twentieth of the purchase price in cash, and the remainder in nineteen annual installments. As interest is charged at 6 per cent a year, the company is virtually lending him, at a nominal rate of interest, the money to pay for his farm.

In 1909 the Canadian Pacific inaugurated what is known as the "ready-made" or improved farms policy. A number of farms were equipped with a house and barn, a well was drilled on each, the whole farm was surrounded by a wire fence, and about fifty acres broken and seeded. Thus a settler could step from the train and proceed to a farm on which he might begin earning an income immediately. The price of all these improvements was added to the value of the land, the total being payable in twenty equal annual installments. The first settlement of these farms was in the spring of 1910, when a number of English farmers were brought to Alberta by special agents of the company. This colony was so successful that the policy has been extended and "ready-made" farms have been established not only in Alberta but in Saskatchewan Manitoba and British Columbia as well

Another extension of the policy of encouraging settlement was witnessed in 1912, when the company made the first of its "loans to settlers." To experienced farmers, "who already own the necessary implements and machinery, and have enough cash to make a payment of one-twentieth the purchase price of the land, the company will advance a loan of $2,000." The applicant must be a married man, actually engaged in farming. He must make a personal selection of the land he desires to buy, and he may buy not more than half a section 320 acres. The loan, which must be spent in improving the farm, is added to the price of the land, and is repayable, together with the rest of the purchase price, in nineteen annual installments. The purpose of this policy is to enable farmers of limited capital to become owners of farms in this part of Canada. The character of the applicant and his experience are obviously taken into consideration. Such loans are made only to men whose past efforts justify the belief that their future will be successful.

9. It will not surprise us to find, after this discussion, that the real wealth of the western provinces is in agriculture, and that the mineral and other products are only secondary in importance. Even in British Columbia, the greatest mineral producer in Canada, agriculture is rapidly taking the place formerly held by mining. The prairie provinces, though underlaid with coal measures, will always be primarily agricultural. The fur trade and fisheries are important only in the north. The future development of

many western cities, the increase of population and wealth, will depend mainly upon the growth of agriculture through irrigation.

10. The variety of products which may be grown on irrigated lands is much greater than is commonly supposed. The principal value of irrigation in the past has been to produce hay and forage for live stock and thus to develop dairying in all its branches. This will probably remain its greatest use. But it should be clear that crops which grow in any latitude where there is plenty of rainfall will grow in like abundance if cultivated on properly irrigated soil. All that is required to produce a bountiful harvest of grains, fruits or plants of any kind is sufficient length of the warm season for ripening and adequate moisture. A good irrigation ditch, with properly regulated flow of water, assures the farmer moisture for his crops which answers every purpose

AN IRRIGATED FARM IN ALBERTA

of a rainfall of from thirty to forty inches. The legal requirement in Alberta is fixed as a continuous flow of one cubic foot per second per 150 acres for 153 days between May 1st and September 30th. The reports of the Dominion experimental farms indicate that irrigation greatly increases the yield of the land. At the Lethbridge experimental station, a plot under irrigation, adjoining a plot not under irrigation, yielded 260% more potatoes, 200% more turnips, 184% more sugar beets, 128% more corn and large increases in peas, barley and spring wheat. These results were obtained on newly-broken land, and it must be remembered that irrigation farming will not begin to yield maximum results until "several crops have been taken off the land and the soil has been reduced to a good mechanical condition."

It has been estimated by experts in charge of the irrigation projects that by the year 1925 there will be hardly a square mile of reasonably level surface in North America now counted among the arid lands but that will be made productive through irrigation. The work of irrigation is being carried on not only in Canada but very extensively in the United States, and there is good ground for the statement that practically all land within the temperate zone will some day be productive.

11. In Mexico and the United States, irrigation has opportunities of development similar to those of the Dominion. Especially in the southwestern part of the United States irrigation on a large scale is being practiced. The Roosevelt Dam in Arizona and Truckee-Carson project in Nevada are the two largest projects now in operation.

In Europe, where agriculture is more carefully developed, irrigation is extensively employed, especially in Italy and Spain. The arid districts of Morocco and Algeria, of Egypt, of central Asia, of China and India have large areas where irrigation has been and still is employed. The Nile valley in Egypt has been under irrigation for many centuries. Primitive irrigation was carried on in India for many years by the natives, and since the English acquisition large sums have been spent on great irrigation projects. Irrigation is now practiced on 50,000,000 acres in India, 8,000,000 acres in Egypt, 5,000,000 in Italy, 3,000,000 in Spain, 15,000,000 in the United States, 3,000,000 in Canada, with smaller areas in China, Japan, Australia, France, South America and elsewhere.

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CHAPTER FOUR

HISTORY AND CIVIL GOVERNMENT

HISTORY

INTRODUCTION

1. What History Is. History is too commonly considered to be a mere record of national events, chiefly military and political, arranged in chronological order. Such a view of history is inadequate. "History is the science of the development of men in their activity as social beings," says Bernheim; and the great English historian, Froude, says, "History is a voice forever sounding across the centuries the laws of right and wrong." We should consider history, then, as the record of man's development, a record that in its scope includes all the activities of the race.

2. Divisions of History. Historical writings are classified in various ways, as ancient history, medieval history and modern history, when the periods are emphasized; church history, political history and military history, when a special phase of activity is emphasized; or as German history, French history, English history and Canadian history, when the national feature forms the basis of classification.

3. Relation of Divisions. Whatever the divisions that may occur in historical writings, we should remember that history as a whole is a unit, that these divisions form parts of that unit and are therefore all more or less closely related to each other. The fact of this relation is of special importance when we come to consider the position of Canadian history as one of the parts of this great whole. We cannot consider the history of the Dominion as wholly distinct from that of foreign countries, especially the United States, France and England. Without the recognition of this relation, the history of the Dominion cannot be given such a setting as will enable pupils to understand the origin and meaning of Canadian institutions.

4. Relation to Other Subjects. As we have seen by its scope, history is related to all other branches of knowledge. Every phase of human activity has its history, and human progress in any given locality is largely dependent upon environment. Nevertheless, some subjects are much more closely identified with history than others. Of this number, geography, art and literature are the most important.

(a) GEOGRAPHY. Countries, climate and natural resources are the most important external agencies in man's development; therefore, a knowledge of these conditions is necessary to the understanding of the history of the people of any locality.

Columbus made his celebrated voyage, not to discover a new world but to find a new path to the Far East. The magnitude of his undertaking can be realized only when we understand the conditions under which the expedition was conceived. To Europeans the known world consisted of their own continent, a portion of western Asia, northern Africa and a few islands in the adjoining coast waters of these continents. The theory that the earth was round, which Columbus held, was not generally believed at that time. He hoped that by sailing westward he would reach Cipango (Japan) in a voyage of 2,500 or 3,000 miles; but the shores he sought were 12,000 miles distant. By taking a course along the parallels which on the maps of the time crossed the southern part of Japan, he entered the American Mediterranean and discovered the West Indies. Unless the pupil understands these conditions, and also realizes the width of the Atlantic Ocean where the expedition crossed, the first voyage of Columbus means but very little. Likewise, the exploration and settlement of the Dominion can be understood only when the pupil is acquainted with the physiography of the country.

The dependence of history upon geographic conditions is too often overlooked in teaching both history and geography.

Teachers should remember that these subjects are inseparable.

(b) ART. In architecture, sculpture and painting we see what peoples of the past have accomplished along material lines, and a study of such works throws much light upon the progress of civilization. Hence, graphic representations are of great value in the study and teaching of history. The present methods of illustration have made it possible for teachers to obtain useful collections of pictures for the work in history, and every teacher should have such a collection in her possession.

(c) LITERATURE. History constitutes an important branch of literature, and the works of the most celebrated historians are considered as classic. Such are the writings of Xenophon, Herodotus, Tacitus and others, among ancient writers; of Froude and Gibbon, in England; Guizot, in France; Mommsen, in Germany; and Bancroft, Prescott, Lothrop and Parkman, in the United States. In addition to historical writings, proper, there is a great body of literature that is founded upon history. Poets of all lands have immortalized minor events by their vivid narration. Tennyson's *Charge of the Light Brigade*, Browning's *Hervé Riel* and Macaulay's *Horatius at the Bridge* are good illustrations of such incidents. The orations of statesmen and others on public occasions, debates in legislative assemblies and the resolutions and platforms of political parties also constitute a class of literature of great historic value. The teacher should be familiar at least with the literature of that portion of history which she teaches and use it for adding interest and clearness to the subject.

PURPOSES OF TEACHING HISTORY

5. Introductory. Every teacher should have in mind certain well-defined ends to be reached in the teaching of history, and they should be included in a plan of instruction extending from the intermediate grades through the high school. Doubtless no teacher will take classes over the entire course, but that portion of it which comes directly under her charge will be more intelligently directed if she has a clear conception of the entire plan.

In graded schools and in many states in the ungraded schools, this plan is found in the course of study. Under whatever conditions the teacher is placed, she should become familiar with the course of study in history before beginning her work. Whatever may be the plan she is to follow, it does not excuse her from attempting to secure certain definite results which should always be attained through the teaching of the subject.

6. Imparting Information. The first purpose in teaching history is to impart information. A knowledge of the leading facts of the history of our own country, at least, is essential to everyone who would be considered intelligent, and whenever possible this knowledge should be extended to include the leading facts of the world's history. Public speakers frequently cite historic incidents to substantiate an argument or illustrate a point; newspapers and periodicals are constantly using historical facts, and unless the reader is acquainted with history he does not understand these allusions.

7. Mental Development. Another important purpose in teaching history is to assist the development of certain mental powers, particularly memory, imagination, judgment and the emotions. During the early part of the school period the memory and imagination are especially active. If properly presented at this time, the leading facts of our history will be indelibly impressed upon the minds of the pupils. (See Volume Three, pages 78-81, Sections 7-10.)

Perhaps no other subject of the elementary and secondary schools is better suited to the training of the reasoning powers than history. In mathematics the reasoning is exact—only one conclusion can be reached; in literature the conclusion is found by the study of the text; but in history the conclusion is invariably problematical; it depends upon the decision of the man or body of men most vitally concerned in the final result. To reach tenable conclusions in problems of history the pupil must bring all his knowledge, experience and judgment to bear upon them. He must consider both sides of the question and weigh the arguments before he can reach a decision. The training received through the solution of such problems fits the pupil to grasp practical affairs. (See Volume Three, pages 84-86, Sections 15-17.)

8. Patriotism. Through their study of history, pupils should be brought into sympathy with our institutions and acquire a love for them. Doubtless patriotism is the focal point around which the teaching of history most frequently centers, but the teacher should have a clear conception of what true patriotism is, before beginning to develop this sentiment in her pupils.

There is a tendency in some places to overestimate the importance of the country to which we belong, but it is far better to have too much faith in one's country than too little. The man who boasts overmuch of his country is a better citizen than the negative type who sneers at his neighbor because of his enthusiasm. The man who recognizes that he owes a duty to his country, which demands that he should love it best and prepare himself to defend it efficiently if necessary, is a good citizen. This variety of patriotism should be stimulated through the study of history in our schools.

True patriotism is that which is based upon the love of our institutions because of what they have cost, and what they represent; the trials and struggles not only of our forefathers in Canada, but of the nations from which they sprang. Such patriotism is based on a love for humanity that extends far beyond the boundaries of our own country.

The citizen actuated by true patriotism is honest in his dealings with all men, gives his share of time and his influence to secure good men for public office, regards his vote as a sacred trust, has due respect for our laws and obeys them, does not shirk public duty, and if elected to office administers the affairs of his office in the interests of the people. Of this kind of patriotism the country is in great need, and it is this that the schools should inculcate.

9. Use of Books. The study of history calls for extensive reading, and through it pupils can acquire facility in the use of books, a facility which they should gain before they leave school. History also should influence the pupil's reading, and lead him to a love for historic literature.

10. Development of Character. "Historical knowledge is moral knowledge." Through the study of history the pupil lives in imagination with the good and great of the past. He learns by what qualities they succeeded, how they extolled virtue and condemned vice, and that because of their heroic struggles for truth and liberty we enjoy the privileges under which we live. Consciously or unconsciously, he is influenced by the lives of these men, and thereby his character is strengthened.

Another way in which the study of history should assist in the development of character is in fostering a desire to search for the truth and a willingness to abide by it when found. The pupil who has a high regard for truth will be truthful and fair-minded in all things. This is another way of saying what we have emphasized regarding patriotism (Section 8). The good citizen is a man of good character.

ORAL INSTRUCTION

11. Selection of Material. The material for history stories for the early stages of the work should be selected with relation to the following points:

First, it should be founded upon historic fact. Many so-called history stories are only fiction, and the use of such material is harmful in the extreme.

Second, the selections should be from Canadian history and those portions of European history, especially the history of England, which are vitally associated with Canadian institutions. Pupils below the high school cannot devote enough time to the subject to enable them to become familiar with more than the leading facts of the history of our own country; Canadian history also affords concrete examples of all stages of progress, from primitive life, as shown by the Indians and other primitive peoples, to life in the most highly-organized society.

Third, the material should easily come within the pupil's comprehension. Biographies of pioneers, such as Cartier, Champlain and La Salle; the lives of bible characters, as Moses, Joseph, Samson, and others; biographies of Old World heroes, real and mythical, as Ulysses, Achilles, Alexander the Great, Alfred the Great and Charlemagne; and stories of primitive life, such as those about the Indians, the French in the St. Lawrence Valley and the early settlements of our Northwest, are more suitable to the first year's work than many which are frequently selected. Among the most interesting biographies will be those of George Stephenson, Benjamin Franklin, and Lord Strathcona, men who were poor boys and later became famous for the work they did to make humanity better by great inventions or by successfully carrying out great enterprises for their country. Canadian boys and girls should be especially interested in the Canadian newsboy who became the wizard Edison. Since biography is particularly interesting to children, it should be selected for the earliest work. In due time, biography can be followed by history stories and stories of invention.

Where the time for this study is limited, it is wise to confine the lessons to Canadian history; but, when time will permit, the pupils should be given an idea of the ancient Greeks and Romans, and should also learn something of early life in England.

12. Method. The true teacher will have her own method, but in its preparation she will secure valuable assistance from the experience and suggestions of those who have had great success in teaching history. The method must conform to the laws of mental development, and contain such devices as will gain and hold the interest of the pupils. (See Volume Three, pages 75 and 94, Sections 4 and 29.) It should include the following points:

(a) SELECTING THE STORY. The first step in the teacher's preparation for the beginning work in history is the selection of material. We have already indicated in a general way by what the teacher should be guided in the choice of this. However, the range of material is so broad that the teacher must scan the field carefully. Unfortunately, books of history stories suitable for children of this age are not numerous, and those obtainable are altogether too brief for the teacher's purpose. She is then under the necessity of resorting to larger works, and the danger is that she will make selections that are too difficult.

Children are always interested in people, and especially in other children; therefore, if these first stories can be about the boyhood of men who became famous, the pupils' interest will be aroused at once. Stories of the early life of Nelson, Wellington and Queen Victoria are good illustrations of what can be used to advantage in Canadian history. The use of these stories does not violate the principle of simplicity, notwithstanding the fact that during later life these men were associated with events which were complex. The stories are to end before this period is reached.

(b) ORGANIZING THE MATERIAL. The second step is organizing the material for the lessons, or arranging the plan of presentation. This step is important, because upon it depends to a large degree the success of the work. A proper organization of the material requires on the part of the teacher a much more extended knowledge of the subject than she can impart to the pupils. From her abundance of knowledge she should select facts and incidents best suited to the class, and in addition to her knowledge of the subject she must have a large sympathy for the children.

First in the plan of organization is the setting. This should include all the geographical and other information necessary to enable the pupils to obtain a clear picture of the surroundings amid which the person lived. It should also contain a vivid description of the person, his dress and such personal peculiarities as will help the pupils to gain as complete a picture of him as possible.

After the setting, the leading facts in the biography should be arranged in their logical order, then the minor points related to each of the leading facts should be selected and arranged in the order in which they are to be presented. This will enable the children to follow the narrative without difficulty, and to recall the points in their logical order. For a teacher to begin a story and then go back and start again in another way not only destroys the pupils' interest in the lesson but also confuses their thought. The story should be thought out carefully, then told in a simple, straightforward manner, without break and without repetition.

(c) TELLING THE STORY. Experience has shown beyond doubt that the most satisfactory results in history at this period are secured through an oral presentation of the subject. At this point the success of the teacher depends upon her ability to tell stories. While some have greater natural aptitude for story telling than others, by training and practice nearly all teachers can become successful in this method of presentation. Each of the leading facts in the story is a topic around which cluster all the related facts. These leading facts form a series of topics which are linked together by their logical relations, and each topic thus selected forms a unit which should be taken up and completed before proceeding with the next. The completion of the story, then, may require several recitations.

Present the story in a clear and animated manner. Use simple language. Make your descriptions real, and so vivid that the children can see the pictures that you present; appeal to the pupils' fund of knowledge and to their experience. Use graphic illustrations, such as maps and outlines on the blackboard, and, whenever possible, pictures that will assist the pupils in forming correct ideas of the subject. When outlines are used, they should be constructed as the story proceeds, and should consist of words, phrases or short sentences, as may be most helpful to the pupils. (See Volume Three, page 123, Section 18.)

Caution. Avoid side issues, and do not extend the units or the story as a whole to an unnecessary length. Only such details as are necessary to enable the pupils to gain correct ideas should be given, and all irrelevant matter should be strictly excluded. One of the most important requisites is that a teacher shall know when to say no more.

(d) REPRODUCTION BY THE PUPILS. After the presentation of the story or of any topic in it, the teacher should call upon the pupils to reproduce what has been told them The recitation should be by the pupils. A word of caution or approval now and then by the teacher is all that should be necessary. The story should be reproduced by as many pupils as the period will permit. Errors and omissions will appear in the reproductions; these should be corrected by the pupils or by the teacher. Errors in language can be corrected by quietly asking the pupil to substitute the right form, without disturbing his train of thought. The aim should be to secure a connected reproduction of the essential facts, in their proper relation and in good language.

An outline on the board will help the pupils to follow the order of the narrative. The pupils should copy the outlines neatly in ink into notebooks provided for the purpose. (See Volume Three, pages 293-294, Section 2.)

13. Transition from Biography to History Stories. Stories should not be repeated at frequent intervals; in order to keep the interest alive, it is well, after a number of biographies have been given, to take up a story whose narrative is concerned chiefly with events. If this can be local, as a story describing the first settlements in the town or state, it is all the more interesting to the children. If material for a story of the locality cannot be obtained, accounts of the early settlements in the colonies, exploring expeditions, such as those of Hudson, Cartier, Champlain, Cabot in the east, or Mackenzie and Selkirk in the northwest, are suitable. All of these and many others should be used during the fourth and fifth years.

The pupils should also be made acquainted with the great inventions which have revolutionized the industries, and therefore many of the customs, of the world. Gutenberg and the printing press, Watt and the steam engine, Whitney and the cotton gin, Fulton and the steamboat, Stephenson and the locomotive, Hargreaves and the spinning frame, Cartwright and the power loom, Morse and the telegraph, Bell and the telephone, and other inventors and inventions should receive attention.

14. Relation to Reading. By the time the pupils have completed the third reader, they should be able to read and enjoy the simple history stories such as Andrews' *Ten Boys*, McMurry's *Pioneers on Land and Sea*, Sedgwick's *Samuel de Champlain*, *The Life of George Stephenson*, and biographies of Captain Cook and Lord Selkirk. It is an advantage if some of the stories in the first books which the children read by themselves have previously been told to them.

The historical element in the reading lessons should also receive attention. Many selections in the readers and others in recitations chosen by the children are based on historical facts. Even some of the songs sung in the schoolroom refer to events in national history. The stories of these events will delight the children. Songs and selections of this character can also be used effectively to embellish and add interest to the history lessons. This line of work should so influence the child's reading that before the end of the fifth year he will have acquired a love for historical literature.

15. Extending the Circle. Up to the seventh grade the pupil has been learning about people and events, without giving any particular attention to their sequence or interdependence. He should now begin the study of events in their chronological order. He should have his attention called to the relation which events sustain to each other and should be led to see that each succeeding event is the direct outgrowth of those which have preceded it.

The periods from the beginning of the settlement of the colonies through the French and Indian War are the most suitable for study at this time. As in the previous work, the material selected should deal only with the leading facts. The settlement, mode of life, industries, government and religion of the four provinces that were first united to form the Dominion in 1867, Ontario, Quebec, New Brunswick and Nova Scotia should be studied. In studying the settlement of these colonies, the pupils should learn something of the classes of people in the mother country from which the settlers came and their reasons for coming to Canada. The colonies should be compared in respect to the influence of geographic conditions, customs of the people in each, their industries, religious beliefs, form of government and provisions for education. This line of study is most successful when centered around the lives of the leading characters, such as Laval, Ryerson, Baldwin and Macdonald.

Certain units should receive special treatment. Among these are Braddock's and Wolfe's campaigns, the War of 1812, Mackenzie's Rebellion and the establishment of representative government. A preparation for the study of the French and Indian War should consist of a review which will enable the pupils to see the relation of events leading up to it. The influence of this struggle upon the future history of the country should be emphasized. These matters are of much greater importance than a detailed study of the military campaigns. (See Section 23.)

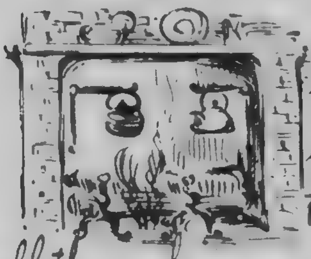
During the work the pupils should be required to obtain most of the information for themselves from books, and specific directions for use of the books at the disposal of the pupils should in any case be given by the teacher. (See Volume Three, page 128, Section 22.) Under no conditions should condensed histories which contain a mere statement of facts and dates be used.

16. Written Work. History affords an abundance of material for written exercises, and placing in writing what they have learned fixes it in the pupils' minds. When the

The Homes of the Colonists.

When the Colonists came to our country they found it very cold. There were no houses for them to live in so the men began to build some. They chopped down trees and made log houses and covered the roofs with bark. They did not have any glass, so they used oiled paper for windows.

In each house was a big fireplace. The men would put big logs into it and the fire would last a long time. The women did all the cooking over this fire. On each side of the fireplace were fastened long, iron arms called cranes. The kettles were hung on these and were swung over the fire.



AN ILLUSTRATED EXERCISE SUCH AS ANY CHILD CAN PREPARE.

pupils have completed the study of a unit they should give a written account of it. Neatness and accuracy in spelling, capitalization and language should be insisted upon in all these exercises. Much interest is added to this feature of the work by occasionally having the pupils illustrate their papers. The illustration on the opposite page shows what can be done without too great expenditure of time. (See Volume Three, pages 123-124, Sections 18-19.)

USE OF THE TEXT-BOOK

17. Work of the Teacher. If the work already outlined in this lesson has been done, the pupils are prepared for the use of the text-book. Before the book is introduced, however, certain duties devolve upon the teacher. The first is to become thoroughly acquainted with the book to be used. This acquaintance should embrace a knowledge of what the book contains, of its weak as well as its strong points, and a comprehension of the plan and purpose of the author. The second duty is to form a proper conception of the book. The text-book is not a fetich to be worshiped, neither is it a mere mass of printed matter to be regarded lightly. The true conception lies between these extremes. The method of using the book will be determined to a considerable extent by the teacher's conception of it, therefore, her estimate should be formed with due deliberation. No text-book should be followed blindly.

18. Assignment of Lessons. Pupils should be started right at the beginning, otherwise they are liable to form a dislike for the subject. Therefore, the teacher should give careful attention to the assignment of the lesson. Fully one-half of the difficulties of the recitation are removed by a proper assignment. Time spent here is time saved in the next recitation. (See Volume Three, pages 112-114, Section 9.) Questions that provoke thought are of great value, for they guide the pupils to a method of study. If the lesson is studied with a view to answering these questions, the pupils will be far less liable to memorize the text, and when they once acquire this method of study they will think of many questions for themselves. Again, if these questions are given when the lesson is assigned, the pupils have opportunity to find suitable answers before coming to the recitation, and they are not confused by being confronted with questions which are too difficult to be answered without deliberation.

19. The Recitation. The assignment of the lesson determines in a large measure the character of the recitation When guided in his study by questions that he is to answer, the pupil is not liable to recite the words of the text. If he does, he should be stopped immediately. The chief purpose of the recitation is to ascertain whether or not the pupils understand what they are talking about, not to hear what they have memorized from the text. At this stage of the history work it is injurious to the pupil to memorize facts without understanding them. (See Volume Three, page 115, Section 11; also pages 264-268, same volume, Sections 10-11.)

The chief purpose of the text-book is that of a guide in the study of the subject, and it should be used in such a manner as to render the greatest assistance. Whenever opening the book in class will settle a disputed point or enable the teacher to direct the pupils in their study, the book should be used. But it should not be used in class for the purpose of assisting the pupils in perfecting their recitation.

20. Outlines. Outlines are occasionally valuable for showing the relation of events, for grouping together the causes which have contributed to a given result, for giving a graphic representation of periods, and for reviews. The outline should be constructed by the pupils and teacher together as the study proceeds, and should be one of the results obtained from the study of the lesson, instead of a guide to that study. An outline should be simple, clear, and so arranged as to bring out strongly the feature that it is intended to represent.

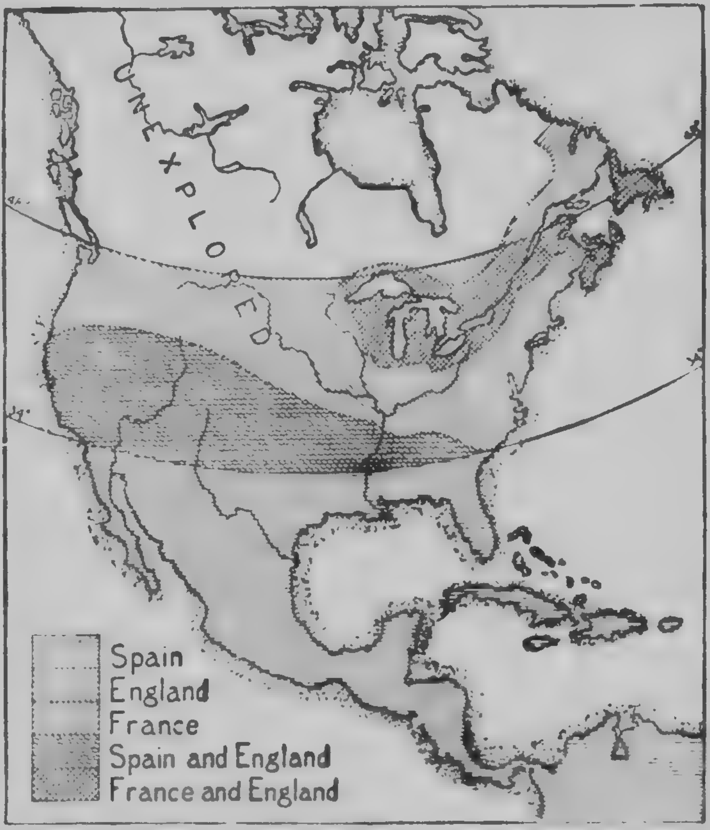
The best outlines for senior pupils are topical outlines History is usually taught as a merchant keeps his day book. All events are taken in chronological order, whether they are logically and topically related or not. The business man must keep a ledger in order properly to understand his business. The topical method of teaching history gives the pupils the ledger view of the evolution of the history of a period or of a nation. The general outline of the history of a country should of course be given to the pupils, and they should be acquainted with the great epochs in its development. Then the best plan to give students a consecutive and related view and understanding of the growth of the nation is to subdivide and classify the great elements of the nation's life and power into separate departments and study these departments independently or topically from the beginning of the nation's history to the present time. By such a method the pupils gain a much clearer view of history and its true meaning and purpose than by any other method.

In the history of England, for instance, the general outline of the history may be made first by dividing the whole period of the existence of the nation into subdivisions based on the succession of ruling dynasties. When this has been done and the dates of beginning and ending the periods fixed in the memories of the pupils, such topics as The Development of Constitutional Liberty, The General Development of the People, The Influence of the Church and The Rise of the Democracy should be carried independently over the entire course of the life of the nation from the beginning to the present time. In this way the pupils will be trained to see the relationship of each step to present conditions. The study of each topic reviews not by mere drill, but in the most effective way possible by using what is already known to assist in revealing and comprehending what is to be learned. This course makes history not mainly a process of memorizing, but a process of logical and social evolution

21. Dates. The subject of dates gives many teachers more trouble than its importance justifies. It is necessary that certain focal dates which mark turning points in history should be remembered. Good examples of such dates are the discovery of America, 1492; discovery of Canada, 1534; founding of Quebec, 1608; British North America Act, 1867; and the date of admission of your province into the Dominion. In most instances it is more important to remember the order in which events occur than the exact year in which they occurred. If the topical method of recitation is followed, the pupils are led to look for causes and effects, and it is not difficult for them to remember events in the order of their occurrence.

It is usually wise to have the pupils keep a list of dates to be remembered, adding to it the dates that they reach in the course of this study. This list should not be a long one. It should contain only the dates of great epochal events, marking eras in constitutional development, or in relationship to our motherland, or in the beginning of great national enterprises such as the opening of the first Canadian transcontinental railway, which made the union of all parts of the Dominion a reality. If the pupils memorize these dates and comprehend the significance of the events which they mark, they have a much better grasp of history than they will obtain from memorizing several times this number without any thought of their meaning. Merely to memorize the dates is a waste of time that might be more profitably employed.

22. The Use of Maps. Geographic conditions lie at the foundation of the great results of history, and it is often as important to know *where* an event happened as to know that it happened. From the beginning of his work in history, the pupil should become accustomed to the use of maps, and during the study of his history lesson the map should be consulted whenever it can give assistance. If the teacher would realize that the map is as important in the study of history as in the study of geography, much of the vagueness and unreality in the minds of the pupils would be dispelled. Good text-books contain both outline maps and complete colored maps, but in addition to these the pupils should construct many simple outline maps for themselves, or procure outline maps and fill them in as the study progresses. The latter is often the better plan, since it furnishes accurate outlines, and the pupils can devote their entire time to filling in the work gone over. Nearly all of the schoolbook publishers offer outline maps at a nominal cost. The accompanying map shows how these can be used



TERRITORIAL CLAIMS OF ENGLAND, SPAIN AND FRANCE IN AMERICA IN 1603 effectively. Both teacher and pupils should also sketch maps on the blackboard whenever such sketches will aid the recitation. Wall maps should be used during the recitation, and often each pupil should be required to point out the places which he names.

23. Military Events. Many text-books devote too much space to wars and military campaigns, to the exclusion of subjects of greater importance. The causes leading to and the results following a war are usually of more importance and should receive greater attention than the military campaigns connected with it. Yet enough attention should be given the military movements to enable the pupils to obtain a clear conception of what the moving of a great army involves and also some ideas of the horrors of war. The best way to do this is to select a campaign in some war and make it a type study. Wolfe's campaign against Quebec, Burgoyne's campaign, the capture of Detroit and inv[illegible] of the Niagara peninsula afford good material f[illegible] treatment. Not more than two should be selected. (See Section 27.)

The cause of most wars is economic. The French and Indian War, so far as the American colonies were concerned, was a struggle for the control of the resources of the Mississippi Valley and the Newfoundland fisheries, and the economic conditions under which the contending forces lived in America contributed largely towards determining the result of the contest. Train the pupils to understand the value of arbitration in settling such disputes. The pupils should be led to see the importance of economic conditions and to realize something of the extent to which they underlie the great struggles in the life of the nation.

24. Civil Institutions. Under this head are included government, education, religious and social customs, and financial measures. These are of much greater importance than the military events, and should receive careful consideration. The development of these institutions should be studied in each period as the work progresses. In the study of colonial life the pupils should have obtained a clear idea of the different characteristics of the English people and the French people, as well as the different ideals of the two nations in religion, education and government. Many of these elements of difference will be brought out in the study of the Quebec Act, 1774, and of the Act of Union, 1841. The two points of view in regard to religious and civil institutions will also be noted in British North America Act, 1867. It should be the purpose of every teacher in Canada to harmonize the two great national elements in our country and the other peoples who are rapidly settling here. Educational and religious movements, great financial measures and governmental measures of every kind should be treated in a similar manner.

It is very important that the pupils trace our institutions from their beginning, and that they be led to realize the self-denials and struggles through which they were secured. The development of sympathy which such a line of study will produce will have greater influence than any other phase of history in the formation of that civic patriotism which we have already described. (See Section 8.)

25. Industries. The influence of our industries on the life of the nation is too often overlooked. When the children first learn about the great industries they are too young to comprehend their effect upon society; during their work in the seventh and eighth years, the development of such industries as transportation; the manufacture of textiles; the growing of wheat and oats; mining; dairying; lumbering; and numerous other lines of work should receive special attention. In the study of industries, special stress should be placed upon their influence on society. Pupils should be led to see how the introduction of the factory system and the construction of railways and canals were the primary causes leading to the growth of cities, and that as cities became manufacturing centers they also became commercial centers. City and country life should be compared and the advantages and disadvantages of each should be pointed out. Were this faithfully done in the rural schools, the glamour with which young people of the country surround city life would largely disappear.

Industries can be studied to best advantage on the plan given for type studies. (See Section 27.) The older pupils should give some consideration to the growth of corporations, and should be given some insight into the formation of stock companies and the manipulation of stocks. This leads to the relation of economics to industries, and we see at once that we cannot discuss the one without the other.

Topics of this nature are of especial interest to the older boys, and serve to lead them into new lines of investigation. They also show the practical side of history more clearly than do its military and political struggles. This phase of history is so closely related to the history of inventions and discoveries that one cannot be dwelt upon to any length without treating of the other. For instance, the history of the power loom and the cotton gin cannot be given without showing their relation to the development of the manufacture of cotton goods in England, Canada and the United States. (See Volume Three, pages 303–305, Section 8.)

26. The Study of Types. In the preceding Section we referred to type studies as affording good means of studying some of the great industries, and they are of special value in saving time and repetition as well as for giving the pupils connected ideas of a subject. The study of one railroad system like the Canadian Pacific Railway, the construction of one canal like the Welland Canal, the development of a single industry like the boot and shoe industry, and of a single campaign, give the pupils fundamental ideas that pertain to all subjects of the class to which the type belongs. The Canadian Pacific Railway is typical of all railroads, and with a thorough study of that the other great railway systems can be passed with only such attention as is necessary to show their relation to the question of transportation.

Type studies should be selected with a view to the work to which they will apply, and the work required of them should be of such nature as to come easily within the capacity of the pupils, and also within their facilities for acquiring the information called for. Within these limitations type studies constitute some of the most valuable work that can be done.

27. A Type Study. As an illustration of a plan for study, the following sketch of Burgoyne's campaign is given:

(a) GENERAL CONDITIONS. At the close of the first year of the war for independence, the British troops occupied only New York and Newport. Sir Guy Carleton had attempted to invade the New England colonies and New York by the way of Lake Champlain, but retired before accomplishing any permanent results. The British naturally were somewhat chagrined at their failure and determined to establish a line of military posts extending from the Saint Lawrence River to New York by the way of Lake Champlain and the Hudson River.

Ever since the settlement of North America these valleys had been the natural highway north and south through that part of the country, and both Abercrombie and Amherst had led large armies through them during the French and Indian War. On either side of the Hudson and of Lake Champlain the country is hilly, and in many places even mountainous. At the time of the Revolution most of this region was covered with heavy forests. There were scarcely any settlements in the vicinity, and forest paths were the only roads.

(b) PLAN OF CAMPAIGN. The British minister of war saw the importance of gaining possession of this highway. If he could establish a series of posts between Canada and New York he could thus cut off the New England states from the others, and he hoped by this means to subdue the different states, section by section. In order to accomplish this, the most formidable campaign projected during the Revolutionary War was organized. The invading forces were under the command of General Burgoyne, an officer of skill and experience. He was sent to Canada with over

4,000 British regulars and 3,000 Hessians, all of whom were veteran troops under the highest degree of discipline. Joined to these were about 300 Canadians and 500 Indians, most of the latter belonging to the Five Nations. This army of about 8,000 men was to ascend Lake Champlain, thence cross over the height of land between the valley of the lake and the Hudson River and descend the river until they formed a junction with British forces, which at the time the campaign was planned were in New York under the command of Sir William Howe.

Another detachment of troops under the command of Saint Leger was sent to the vicinity of Oswego and was to march down the Mohawk Valley and capture Fort Stanwix, an American outpost that commanded that portion of the frontier.

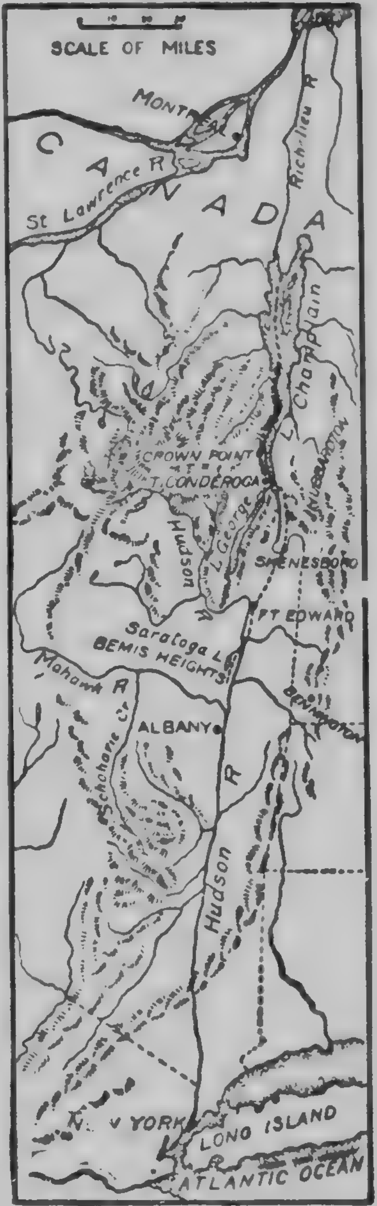
Opposed to these movements was a force of about 3,000 Americans in the fort at Ticonderoga, under the command of General Saint Clair, and another force of about equal numbers at Fort Edward, on the Hudson, under the command of General Schuyler.

(c) BURGOYNE'S INVASION. Burgoyne moved his army up the Richelieu River and Lake Champlain in boats. Near Ticonderoga was an eminence that overlooked the fort. Thinking this point was of no importance, the Americans had failed to occupy it. The British at once placed cannon upon this height, and against these cannon the walls of the fort afforded the Americans no protection; therefore, Saint Clair evacuated Ticonderoga during the night, crossed the lake and started towards Fort Edward to join Schuyler.

The rear guard of Americans was overtaken at Hubbardton by a detachment of British under General Frazer. At first the Americans were successful, but the British were reenforced and the American commander, seeing that his troops were to be overwhelmed by superior numbers, ordered them to break ranks and disappear in the forest, with instructions to meet at Manchester at future date. While the battle of Hubbardton was a victory for the British, the stand taken by the Americans delayed the pursuit of Saint Clair's army so long that he was able to join Schuyler at Fort Edward without further loss.

Up to this point Burgoyne's progress had been unobstructed, and he thought that the ease with which he captured Ticonderoga was to characterize all his movements until he joined forces with Howe. But the British commander, as well as the British ministry, had failed to take into consideration some very important conditions. Among these were the condition of the country and the consequent difficulties attending the movement of a large army with its supplies and artillery. They had also mistaken the attitude of the inhabitants of this region.

While the country was sparsely settled, nevertheless it contained hundreds of sturdy farmers and woodsmen who knew every mile of the forest and also knew how to use the ax and the crowbar tools to which Burgoyne's soldiers were entire strangers. From the time he left Ticonderoga until he crossed the



MAP OF BURGOYNE'S CAMPAIGN

Hudson River, Burgoyne was fighting an unseen foe. He found his roads obstructed by huge trees that were felled across them; wherever bridges had been built they were demolished, and often the repairs which his soldiers made during the day were destroyed at night. His progress was very slow; between Hubbardton and Fort Edward it averaged about a mile a day. His supplies were getting short. His Indian allies, because of restrictions placed upon them, became disgusted and withdrew. He had been obliged to leave about a third of his forces to guard Fort Ticonderoga; consequently, the number of his troops was constantly diminishing. On the other hand, the Americans from far and near were flocking to General Schuyler's standard. The employing of the Indians had greatly incensed the people of all that region, and regardless of their former allegiance they banded together to suppress an invader who would bring with him a horde of savages who in battle could not be restrained, but indiscriminately massacred men, women and children.

(d) BENNINGTON. The Americans had gathered a quantity of provisions and military supplies at Bennington. Burgoyne, hoping to replenish his supplies, sent a detachment of troops under Colonel Baum to capture these stores. Through American scouts all of his movements were known, and when the British forces reached Bennington they found themselves confronted by from two to three times their number of American yeomen under the command of General John Stark. A heavy rain delayed the battle for twenty-four hours, thus giving the British an opportunity to entrench themselves upon a hill. However, the ignorance of the British commander was greatly to the advantage of the American forces. By moving in small squads of five or six, they passed entirely around the British works and assembled so as to attack the enemy from both front and rear at the same time. This attack the British were unable to withstand, because the Americans were skilful riflemen and seldom missed their mark. In a short time Baum and his forces were either killed or captured. A second detachment of British troops under Colonel Riedesel arrived upon the field at just about the time that a second detachment of Americans under Colonel Seth Warner reached Bennington, and another engagement followed, in which the Americans were equally successful. The battle of Benrington was a serious disaster to the British commander.

(c) SAINT LEGER'S CAMPAIGN. Shortly after the battle of Bennington Saint Leger's force encountered the Americans under General Herkimer at Oriskany, and one of the bloodiest battles of the war ensued. Herkimer was mortally wounded, but the British and Indians were finally driven from the field. They proceeded toward Fort Stanwix and were again attacked and driven back. While Saint Leger was recuperating his forces at this point, Benedict Arnold with 1,200 men was dispatched by General Schuyler to Fort Stanwix to assist the Americans in repelling the British. Arnold captured a company of British scouts, among whom was a half-witted fellow whom he threatened to put to death unless he would frighten Saint Leger's troops so that they would immediately retreat to Canada. To this proposition the doomed man readily agreed. Arnold caused the man's coat to be shot full of bullet holes, then sent him back to Saint Leger, accompanied by two friendly Indians. On reaching the headquarters of the British commander he explained that Burgoyne's forces had been utterly defeated and captured, and that the whole American army was coming up the Mohawk Valley. This report was confirmed by the Indian guides. When Saint Leger asked him concerning the number of American troops, the man pointed to the leaves of the trees and said that they were so numerous that they could not be counted. Arnold's ruse succeeded far better than he expected. The British were so thoroughly frightened that they beat a precipitate retreat, and little more was heard of Saint Leger or his troops except as guerrillas on the frontier.

(f) BURGOYNE'S SURRENDER. Burgoyne's army was now placed in a critical position. Without supplies, with communications cut off and the American troops increasing in number, his only hope was in cutting his way through to General Howe's forces on the Hudson or retreating speedily to Canada. Since quite a large body of Americans had gathered in his rear, it was doubtful whether the retreat could be accomplished, and he decided to push on and join Howe. After crossing the Hudson he was confronted by the American forces at Bemis Heights and again at Freeman's Farm. In each encounter the British were disastrously defeated, and the only course left to their gallant commander was to capitulate, which he did on October 17, 1777. Thus fell into the hands of the Americans the largest and best-equipped army that England sent to the colonies during the Revolution, together with all their arms and munitions of war. The effect of this battle was to give the American cause increased prestige in Europe and thereby to secure the assistance of France, without which possibly the Revolutionary War could not have been won. For these reasons the surrender of Burgoyne is considered to be the turning point in the war.

(g) SUGGESTIONS. This sketch contains only the thread of the narrative. To this the teacher should add such facts and incidents as will awaken the interest of the pupils and also enable them to gain some conception of the difficulties attending the movements of a great army through a new country. John Burgoyne, Barry Saint Leger, Benedict Arnold and Horatio Gates are such prominent characters in the campaign that the study should include their biographies, briefly summarized. The influence of geographic conditions is also so important that it demands special consideration.

If this campaign is studied according to the plan given, the other campaigns of the war can be passed over lightly, in most instances merely noting their location, origin and result.

28. History and Literature. Much of our early literature is devoted to the discussion of political questions, and consists of speeches and public discussions. Some of the best of these have been preserved, and extracts from them can often be used in connection with the history lessons. Good illustrations are some of the speeches of Samuel Adams and Patrick Henry, among Americans, and Burke's Speech on Conciliation, on the British side. The poets have also done much towards preserving the memory of important historic events, and such poems as *The Courtship of Miles Standish*, and *Evangeline* should be drawn upon to illuminate the incidents to which they refer. Short poems can be studied in connection with the lesson, but the longer ones should be used as supplementary reading, unless they form a regular part of the work in literature.

29. Current History. Pupils should understand that history is being made every day, and that present history is related to past as effect to cause. Occasionally, teachers refrain from teaching recent history because of the complex problems bound up in it, but these events are often so similar to those that have happened that they offer excellent illustrations of the points under discussion; when used for such a purpose, recent events become of great interest to the class and are well understood.

30. Reviews. This subject is discussed in Volume Three, page 106, Section 3.

CIVIL GOVERNMENT

31. Correlation of Canadian Government and History. In the preceding Sections reference has frequently been made to correlation of history topics, with special reference now and then to the importance of emphasizing the development of our civil institutions. If this work has been done, by the time the pupils reach the formation of the Dominion in the course of their study of history they are prepared to take up and discuss the leading features of the Constitution. A study of the Quebec Conference should bring out the conditions which made the formation of a single confederation advisable, the reasons for the division of powers between the Dominion and the provincial governments, and the departments of the government as established. The essential principles on which the Dominion constitution was based should be made clear. The British North America Act assigns to the general government and to the different provinces their powers, but any rights not otherwise specified belong to the general government. The teacher may well point out that the constitution of Canada was the first attempt to adapt the British principles and methods of government to a federal system. The government, therefore bears striking resemblances both to the United States and the British government. In principle, however, the Dominion shows one great difference from the United States: the Dominion is a federation, in which the provinces have merged their own sovereign powers; the United States, on the other hand, is a federation in which the individual states have surrendered only those powers absolutely necessary to the government of the whole.

The teacher should also point out the necessity of separating the government into departments. One or more persons may be trusted to make the laws, another group may execute them, and a third group may interpret them. If any one man or group of men should assume to interpret and execute the laws a well as to make them, there would be an end of free government

32. Powers of the Dominion Government. The powers of the Dominion government are best understood when they are brought out by concrete illustrations. To operate a government requires a large sum of money, which must be raised by taxation. Whence did the government obtain the power to levy taxes? The answer to the question is obtained from the British North America Act, Section 91. The answer opens the way for the discussion of direct and indirect taxes, and the difference between these methods of taxation should be explained and illustrated. When the class reaches the

[illegible]

[illegible] of Washington, 1871, the treaty-making power of the [illegible]ment and its limits should be explained. The elections [illegible]ately following the organization of the Dominion lead the study of the method of electing members of the House Commons and the appointment of the Ministry. The [illegible]hase of the Northwest Territories affords an excellent [illegible]tration of the national character of the government.

DOMINION COURTS

TITLE	ORGANIZATION	JURISDICTION
Supreme Court	A chief justice, salary $10,000; five puisne or associate judges, salary, $9,000.	This court is the highest in the Dominion. It has appellate jurisdiction in civil and criminal cases throughout the Dominion. The Governor-General has authority to refer to the Supreme Court important questions relating to education, provincial legislation or any problems of general importance. In unusual cases, where the question at issue is of great importance, appeals are sometimes allowed from the decision of the Dominion Supreme Court to the Privy Council of Great Britain.
Exchequer Court	One judge, salary, $8,000	This court hears all cases in which the revenue or other interests of the Dominion government are involved. It has jurisdiction in cases on copyrights, trade marks and patents, and hears claims against the government for injuries received from or in the construction or operation of a public work. In time of war it may sit as a prize court.
Admiralty Court	Six district judges, salary as follows: Quebec, Nova Scotia, New Brunswick and British Columbia, $1,000; Prince Edward Island, $800; Toronto district, $600.	This court has jurisdiction over all civil cases in any way relating to navigation, shipping, trade and commerce in Canadian waters. Admiralty business may be transacted in any of the six district courts.

Each event that relates to a power of the government not already studied should be treated in a similar manner when it is reached.

Doubtless the judiciary department is the most difficult to understand, but its leading features may be grasped readily, and the study of details should be left for the more advanced work of the high school. The outline on page [illegible] presents a comprehensive view of the Dominion courts, and will be found helpful. The teacher should prepare a similar outline of the courts of the province.

33. Local Government. Local government includes the government of the school district, the township, the county and the province. It is better adapted to lessons for the younger pupils, because the pupils can find concrete illustrations of its workings at home. By the time the pupils are old enough to take up work of this nature they know that certain men engage the teacher and look after other interests of the schools, that others look after the roads and streets, and that taxes are paid to the official authorized to receive them.

By using these and other common functions of government, the teacher can give many valuable lessons which will convey to the pupils a fair understanding of the powers and duties of local authorities and set them to thinking about their own relation to the laws and their enforcement. The details of elections should not be attempted at this time. But beginning with the school district, the lessons should be extended to include the township, village or city, as the case may be, and the county. Pupils prepared to take up the systematic study of history with a text-book can also understand the organization and workings of the provincial government. (See Volume IV, page 91.) The average citizen comes in contact with the provincial government more than a score of times where his interest touches the Dominion government once. The basis of provincial government is older than the Dominion government, which is patterned after the government of some of the original provinces. In organization, the provincial government and the Dominion government are also very much alike; each has a legislative, executive and a judicial department. If pupils do this work during the first year that they use the text-book in history, they have a good foundation for the study of the national government, as the work of the following year leads to it.

34. Importance. Time can seldom be found for special classes in civil government in the public schools, but it is very necessary that the pupils obtain some idea of the organization and working of the government under which they live, because the majority of them never attend a high school or collegiate institute. It is, therefore, the duty of the teacher to do this work in connection with the history lessons. If necessary, some of the details of our history should be omitted to make room for these lessons, which are of far greater value than such topics as accounts of the campaigns of the War of 1812, the proposed Canadian contributions to the naval defence of the Empire, and discussions on tariffs and reciprocity which pupils cannot understand.

35. Use of the Text-Book. The study of civil government by the use of the text-book is usually taken up in the high school, and the line of work that may be attempted depends to such a considerable extent upon the year in which the subject occurs in the course of study, that no outline of plan is here attempted. Pupils in the fourth year can enter much more fully into details than pupils in the first year, and the teacher must be guided by the maturity of the class, the time that can be devoted to this branch, and, to some extent, by the sources upon which the pupils can draw for information. Whatever the scope of the work, emphasis should be placed upon two features—obtaining from it a clear understanding of the great underlying principles of our government and discovering concrete illustrations of the various points discussed during the study.

36. Aids. Every teacher of history should make a collection of material which will be useful for additional information and for illustration. The material naturally arranges itself into three groups—books, clippings and objects.

(a) BOOKS. The following list of books is arranged in groups, those of each group having special bearing upon the subject named.

Books of Methods

Special Method in History. C. A. McMurry. 291 pages. The Macmillan Company of Canada. This is an excellent work. Its style is clear and simple, and it is especially helpful in directing the work of the intermediate years. Though written primarily for American schools, its principles are readily applicable to Canada.

Methods in History. Mace. 311 pages. Ginn & Company. This book is somewhat philosophical and a little difficult to read, but it contains much good material, and any teacher will be strengthened by its study.

Teaching of History and Civics in the Elementary and Secondary Schools. Bourne. 385 pages. Longmans, Green & Co. This is one of the very best books on general method, and is comprehensive in scope.

Study of History in Schools. Report of the Committee of Seven The Macmillan Company of Canada. This volume is the report of a special committee appointed by the American Historical Association

How To Study and Teach History. Hinsdale. 365 pages Appleton's International Educational Series. This is written particularly for teachers in the elementary and secondary schools, and has particular reference to the history of the United States. The last chapter is followed by a syllabus which gives a clear and concise analysis of the book.

Reference Works

History of Canada. Kingsford. Rowsell and Hutchison Toronto This work, in ten volumes, dealing with the period from 1608 to 1841, is the most comprehensive of our histories.

A History of Canada. Charles G. D. Roberts. The Macmillan Company of Canada. This work is a model of literary excellence, and is accurate and concise.

Short History of the Canadian People. Bryce. Sampson Low, Marston & Co. A brief but useful work for ready reference

Story of Canada. Bourinot. Stories of the Nations Series. G. P. Putnam's Sons.

The Tercentenary History of Canada, 1608–1908. Frank Basil Tracy. P. F. Collier and Son. A readable and serviceable work.

In addition to the foregoing general histories, there are a number of smaller books suitable for special biographical studies, such as the following:

Brief Histories. Miller. Copp, Clark Co

Stories From Canadian History. Marquis. Copp, Clark Co

Stories of the Maple Land. Young. Copp, Clark Co.

Heroines of Canadian History. Herrington. Wm Briggs, Toronto.

Brock. Marquis. Morang Co.

Wolfe. Wood. Morang Co.

Supplementary Books

The Romance of Canadian History. Edgar. The Macmillan Company of Canada.

The Fight with France For North America. A. G. Bradley. Archibald Constable & Co

Canada under British Rule. Bourinot. Cambridge University Press.

History of the Hudson's Bay Company. Bryce

The Union Jack and its Connection with Canada. Cumberland. William Briggs

Chronicles of the St. Lawrence. Le Moine.

Canada in the Twentieth Century. Bradley. Constable & Co.

Colonial Dames and Goodwives. Alice Morse Earle. Houghton, Mifflin Co.

Pioneers of France in the New World; Jesuits in America in the Seventeenth Century; La Salle and the Discovery of the Great West; The Old Regime in Canada; Count Frontenac and New France under Louis XIV; A Half Century of Conflict (2 vols.); *Montcalm and Wolfe* [illegible]; *The Conspiracy of Pontiac* (2 vols.). Francis Parkman. Little, Brown & Co. Parkman's works are the most complete and authentic of those which treat of French history in America. They are pleasing and interesting in style, and constitute one of the most valuable sources of history stories for the intermediate years.

Makers of Canada. A series of biographies which forms an excellent framework for the study of Canadian history. The volumes may be purchased in sets or in single volumes. The complete set will be found too expensive for many schools, but some of the volumes are standard, and should be in every library. The publishers are The Macmillan Company of Canada.

The New Practical Reference Library. 5 volumes. Hanson-Bellows Company. This is an excellent reference work for both teacher and pupils. Simple in style, fully up to date, printed in clear type and sold at a price which brings it within reach of everyone, this work forms a valuable accession to the teacher's library.

Civil Government

Canadian Civics. Jenkins. Copp, Clark Co. This is the best little book on the subject for the teacher

The British Subject: His Rights and His Duties. Bateson and Weston. McDougall's Educational Company, London. It deals in a very interesting and simple manner with government and citizenship in the United Kingdom, but is very suggestive as well from the Canadian standpoint

How Canada Is Governed. Bourinot Copp, Clark Co. This is a brief, simple but authoritative outline of the Dominion and local governments

A Manual of Constitutional History of Canada, from the earliest period to 1888. Bourinot. Dawson Brothers

Canadian Constitutional History and Law. A. R. Hassard Carswell Company

(b) CLIPPINGS. Current magazines and newspapers frequently contain articles which are helpful in teaching history. The teacher should be on the watch for these and place them in such form that they can readily be found. In order that she may do this, she should have a carefully-arranged scrap cabinet. This can be prepared at little expense, by using large envelopes in which to keep the clippings. Each envelope should be devoted to a topic or a period, as the period of exploration, the struggle between the English and French for the ownership of Canada, the War of 1812, and the subject should be written across the envelope in large letters; the title of each clipping should be written below, on the back of the envelope. This arrangement is very convenient and with proper caution about placing clippings back in the envelopes from which they are taken, the scrap cabinet can safely be placed at the disposal of the pupils. Pictures illustrating different periods should be collected and filed in the same manner. A card index of magazine articles, books and chapters of books should also be kept. (See Volume Four, page 108, Section 15.)

(c) OBJECTS. Oftentimes a small museum of historical objects can be collected for the school. Some pupils may have in their homes objects which have been handed down through the family for several generations, and may date back as far as the Revolutionary period. These the families are usually willing to loan, provided they are assured that the articles will be properly cared for. The collection of such material adds interest to the work, gives it a reality and also enables the pupils to contribute something from their own stock of material.

WORK BY GRADES

37. Explanatory. The work suggested in the following sections pertains entirely to Canadian history. Equally valuable and instructive lessons in ancient history and English history can be given, provided time for these can be found but it is so seldom that this can be done in the average school that it is not thought wise to complicate the outline by suggesting exercises on these subjects. Where European history can be taken, schools are usually provided with a course of study in which an outline of the work is given. The course outlined below may be condensed for one or two years' study, especially if the pupils are in the seventh or eighth years.

38. Fourth Year. The history work in the fourth year should be through oral instruction or in connection with the reading, and it will frequently be related to work that is taken up in the geography class:

(1) Biographies of pioneers and stories of pioneer life.

(2) Stories of Indian life.

(3) Columbus and his voyages. Section 4 (a)

(4) Other Spanish explorers: Vasco da Gama, Ponce de Leon, Balboa, De Soto.

(5) Cortez and the Aztecs: Pizarro and the Incas

(6) French explorers: Cartier, Champlain, the Jesuit missionaries

(7) The Iroquois: their life, customs, form of government, military organization.

(8) La Salle and his expeditions.

(9) Magellan and the first voyage around the world.

(10) English explorers: the Cabots, Raleigh, Drake, Frobisher, giving only a brief account of each. For directions for most of the work in this grade, see Sections 11, 13 and 14.

39. Fifth Year. In the fifth year the work should begin to assume a more formal aspect and to give the pupils a broader view. (See Section 15.)

(1) Pioneer stories of the home province

(2) The Huron and Algonquin Indians: their methods of life tribal organization and customs and military organization. Compare with each other and with the Iroquoi

(3) Samuel Hearne's expedition. (See Volume Three, page 288 Section 1.)

(4) Sir Alexander Mackenzie's exploration

(5) Travels of Simon Frazer and David Thompson

(6) Quebec: cause of settlement; character of the colonists geography of the country; occupations of the colonists; events, character of the government

(7) Social customs: large estates, seigniorial system, classes of society, churches and schools. (See Volume Three, pages 204-296 and pages 303-305, Sections 3 and 8.)

(8) The Maritime Provinces

(9) Ontario

(10) Manitoba.

For each of these follow the plan for the study of Virginia, and call attention to the most important events only Details should be omitted until a later date

40. Sixth Year. This year should begin the systematic study of history, heretofore the work having been given without any reference to chronological order. The work of the year naturally divides itself into two parts:

I. Development of the Colonies
  (a) The Maritime Colonies: explorations of Cartier; French settlement of Acadia, later seized by English; English colony in Nova Scotia.
  (b) Quebec: explorations of Champlain; founding of Quebec and Montreal; Jesuit missions; royal government; Frontenac, border wars; Herville and Acadia; social conditions; education

II. The Struggle for a Continent.
  (a) Causes; contrast in the French and English methods of colonization; contrast in the treatment of the Indians by the French and the English
  (b) Minor wars: King William's Queen Anne's and King George's, giving only brief attention to details

French and Indian, or Seven Years' War, boundaries of French and English Territory in 1754, preparations for the struggle; capture of Louisburg, Fort Duquesne and Fort Frontenac; fall of Quebec and Montreal; end of French rule in North America.

41. Seventh Year. If the work outlined above has been completed, the seventh year class is ready to study the history of Canada under British rule. (See *Use of Text-Book*, Secs. 17-30.)

I. Early British rule, 1760-1774.
  (a) French-Canadians reconciled.
  (b) Conspiracy of Pontiac.
  (c) Quebec Act, 1774.
II. The American Revolution.
  (a) Causes.
  (b) Leading campaigns and important battles.
  (c) United Empire Loyalists.
  (d) Political results.
  (e) Biographies of the most prominent men connected with the struggle. These will naturally be studied in connection with the events with which the men are most particularly associated.
III. Exploration and settlement.
  (a) Hudson's Bay Company and the fur trade.
  (b) Red River settlement.
  (c) Hearne, Mackenzie, Fraser and Thompson.
IV. Changes in government.
  (a) The Constitutional Act, 1791.
  (b) Representative government.
  (c) Simcoe and Lord Dorchester.
V. Social and economic progress.
  (a) The habitants.
  (b) Loyalist settlements.
  (c) Pioneer Life.
  (d) Newspapers.
VI. War of 1812-1814.
  (a) Its causes.
  (b) Danger to Canada.
  (c) Principal campaigns.
  (d) Sir Isaac Brock, Laura Secord and other biographies.
  (e) Results.

42. Eighth Year. The work of the eighth year is a continuation of that of the seventh, and includes the history of the country from the beginning of the struggle for representative government to the present time. Emphasis can be placed only upon the most important events, and as far as possible the pupils should trace causes to effects

I. Demand for responsible government
  (a) Problem common to all the colonies
  (b) Sir John Beverley Robinson, Bishop Strachan and the Family Compact.
  (c) Papineau and quarrels in the Assembly of Lower Canada
  (d) Joseph Howe in Nova Scotia
  (e) Wilmot in New Brunswick
II. Rebellion and Reform
  (a) Mackenzie and Papineau, leaders of rebellion
  (b) Lord Durham's report
  (c) Union Act
III. Responsible government achieved
  (a) First union Parliament and the first Baldwin-La Fontaine ministry
  (b) Rebellion Losses Bill and second Baldwin-La Fontaine ministry
  (c) Reformers triumph in the maritime provinces
  (d) Abolition of clergy reserves and seigniorial tenure
  (e) Municipal Corporation Act
IV. Expansion.
  (a) Development of the fur trade and the Northwest
  (b) Vancouver Island and British Columbia
  (c) Settlement of boundary disputes with the United States.
V. Movement for Confederation
  (a) Impetus given by Lord Durham's report
  (b) Union sentiment in Nova Scotia, New Brunswick and Prince Edward Island
  (c) Charlottetown Conference
  (d) The Quebec Conference and what it accomplished
  (e) The "Fathers of Confederation
  (f) British North American Act passed, 1867; its principal provisions.
VI The Dominion of Canada
  (a) The first ministry; Sir John A Macdonald, premier
  (b) Acquisition of Rupert's Land
  (c) Red River Rebellion.
  (d) Manitoba, British Columbia and Prince Edward Island join the Confederation
  (e) The building of the Canadian Pacific Railway

(f) Organization of the North-West Territories; the Saskatchewan Rebellion
(g) The Washington Treaty, 1871
(h) Formation of the provinces of Alberta and Saskatchewan
(i) Progress in education
(j) Industrial and commercial growth
(k) Canadian literature
(l) Canada as a part of the British Empire
(m) Recent political events

43. Conclusion. The course thus outlined is not intended to be restrictive. It is merely a logical, if somewhat arbitrary, division of Canadian history into a number of periods. Probably no single course of instruction can combine all possible points of view, but such an outline will be the foundation on which work in history may rest. In considering a year's work, the teacher must decide the relative importance of European and Canadian history, the relation of the history lessons to the reading, literature and geography, and the basis for a selection of topics.

The principal reasons for the prominence of Canadian history in the outline is that Canadian history, from the earliest explorations and settlements, advanced by regular steps to the present complexity of social, industrial and political life. Our own history illustrates almost all of the important stages of a nation's growth. It is natural and desirable that many events and epochs in Canadian history be interesting to children.

No better way of introducing history to children can be found than the biographies of great men. It should be the aim of the teacher to let the child relive, as far as possible, the lives of others. The more biographies a child studies in this way, the more his own life is expanded and identified with the lives of his fellow-beings. Great men are usually representative. They embody the character and opinions of classes or nations. The study of biography, therefore, has a socializing influence; to understand representative men is to understand the classes which they represent. Children should be taught to see how the historical experiences of the past are being related to the present, how history, in fact, controls our lives today. But the child can learn only those facts which he understands and appreciates. The teacher must select only those parts of history appropriate to the capacity of the children in her care.

It has sometimes been said that one aim, if not the chief aim, of history study, is to teach patriotism. True patriotism does not consist in magnifying ourselves and our own country at the expense of other nations. Canadians have enough to be proud of without making extravagant boasts. Fair-mindedness and honesty will allow us to study some of our own mistakes. Europe can teach us many lessons. Canadian history must include much material from other countries. The Cabots were Frenchmen in the service of England. Cartier, Champlain, La Salle, Frontenac, Montcalm and Wolfe belong to European history as truly as to Canadian. No history of Canada is complete without reference to the colonies which later united to form the United States. The teacher must try to cultivate liberality and unprejudiced attitude in the pupils towards the many events which they study. History in the public schools should begin and end with Canada, but it should be supplemented by such European and United States history as will give the needed breadth.

History should never be studied in a matter-of-fact routine. The child should see the people of history as vividly before him as he once saw the hero of any fairy tale The imagination should have free play. If history becomes a living thing, then the related subject of civil government presents little difficulty. It is much easier for children to see ideas and institutions springing up in history than to study civics as a separate science. They must see that as the people and the country grow, so grows a constitution.

History should be so taught that it will shed light on other studies, especially literature and geography. Above all it may have a moral influence. It teaches morals both as shown in individuals and in communities. The English historian Froude said that it is in "the struggle, ever failing yet ever renewed, to carry truth and justice into the administration of human society; in the establishment of states and in the overthrow of tyrannies; in the character and deeds of the great actors in the drama of life, where good and evil fight out their everlasting battle—that the true human interest of history resides."

TEST QUESTIONS

1. When should systematic study of history begin? What previous preparation for this work should the pupils have? Give reasons for your answers.

2. Show how you would teach the right sort of patriotism (a) to classes in the intermediate years; (b) to classes in the higher years.

3. Give a plan for teaching a patriotic poem such as The Charge of the Light Brigade.

4. In teaching the facts of the French and Indian War, what points should be emphasized? What relation did this war bear to the American Revolution?

5. Why are the causes leading to and the results following a war of greater importance than the military campaigns? Illustrate by referring to the American Revolution or any other war in which Canada was involved.

6. What has been the influence of the railways upon the history of the Dominion? How would you teach this relation to a seventh year class?

7. Make a list of teaching topics in Civics suitable for a Third Book class, (a) in an urban school; (b) in a rural school.

8. How are the schools of your municipality supported and administered? What are the obligations of the pupils toward the locality in which the school is situated?

9. "The inability to discover what a book contains or where information is to be found is one of the common failings of the unschooled and the untrained man." Show the value of a pupils' reference library in history in this respect.

44. Type Study on Columbus

Suggestions as to Method

(*a*) This is a historical topic which is geographic in its whole setting and purpose.

(*b*) Study maps which show the actual knowledge of the world possessed by scholars before the first voyage of Columbus. A map of the world as well known at the time is pretty small. Most of the world still lay in the unknown.

(*c*) Notice in the reference books the superstitions commonly prevailing among people about the unknown regions of the earth.

(*d*) Make a study of the old routes to India via Arabia and along the Tigris and Euphrates. Also the products brought from eastern lands.

(*e*) Review the story of the Crusades and the story of Alexander the Great.

(*f*) The world map is necessary in the story of Magellan and later navigators.

(*g*) Collect pictures of the vessels of Columbus and Magellan and compare them in size with great steamships of our time.

(*h*) Compare with one another on a map of the world the different routes to India that have been used from the time of Columbus to the present, including the canal routes and land routes.

Outline of Topics

1. His aim.
2. His first voyage.
3. Later voyages of Columbus.
4. Vasco da Gama. Americus Vespucius.
5. Magellan's voyage.
6. Search for the Northwest Passage.
7. Suez and Panama canals.

COLUMBUS

1. When Columbus was born at Genoa in 1436, a spirit of great unrest had arisen among the sea-faring nations of Europe. Marco Polo had returned from his wonderful journey to China, or Cathay, as it was then called, and told of the wealth of spices, silks and precious stones found there and in Japan, or Cipango. Some adventurous mariners had been carried in Chinese ships from the Persian Gulf to Cathay, and now the desire among all mariners was to find a short way to these lands of wealth and wonder.

Columbus at the age of fourteen entered upon a seafaring life and made several voyages, mostly in merchant ships in the Mediterranean. When not at sea, he made maps and charts in Genoa, as there was a great demand for work of that kind. In 1470 he followed his brother, Bartholomew, who was also a sea-faring man, to Lisbon. Prince Henry of Portugal was greatly interested in navigation and discovery, and Lisbon had become the center of nautical science. When Diaz, a Portuguese navigator, finally sailed around Cape Horn, Bartholomew was with him. The fears of his men caused Diaz to turn back before he reached the Indian Ocean, or a water-way to the famed Indies might then have been discovered.

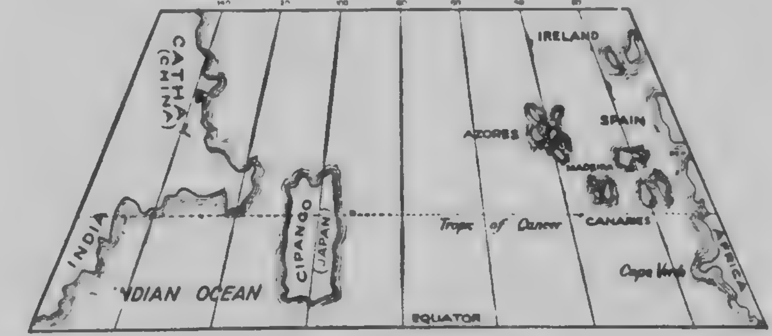
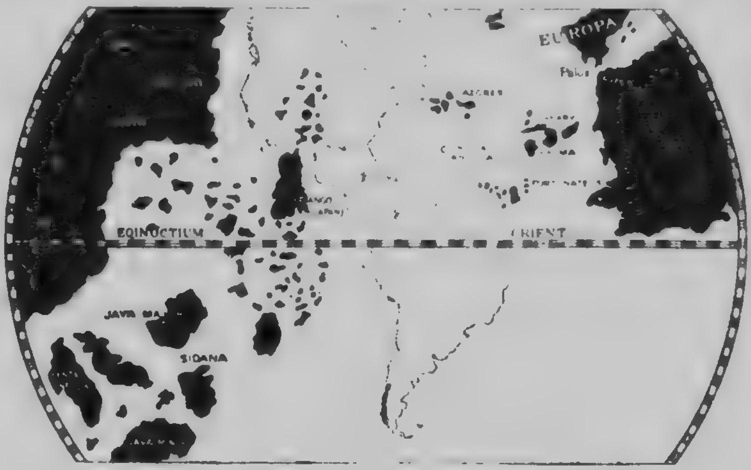


CHART SENT BY TOSCANELLI TO COLUMBUS IN 1474

Soon after reaching Portugal, Columbus married the daughter of a navigator. On the island home of his father-in-law, he continued his nautical studies. Like some other students of the time he became convinced that a short route to Cathay might be found by sailing westward. He wrote to Toscanelli, the great astronomer and geographer, who agreed with him in thinking that the land of "gold, pearls and precious stones" could be reached by sailing westward.

From many other sources Columbus found proofs of the correctness of his views concerning the earth's shape. After the war with Castile was ended he asked the King of Portugal for aid, but as his scheme was pronounced visionary by a body of learned scholars, King John refused to consider it. Columbus went to Spain, but Ferdinand and Isabella, although interested in the project, were unable to provide the money necessary to carry it out. Through his brother, he appealed to Henry VII of England, but was unsuccessful here as elsewhere. France also refused aid.

In the spring of 1491, Columbus, utterly discouraged, decided to leave Spain. With his young son he had proceeded as far as the Franciscan convent of la Rabida, where he stopped for refreshment. The prior, Juan Perez, became greatly interested in his story. This prior had been the queen's confessor, and he sent her a letter which brought an invitation to him and Columbus to visit the court. Here a company of learned men passed favorable judgment upon his plans, and when Granada surrendered in 1492, the queen promised him the necessary aid to carry them out.



BEHAIM'S MAP OF 1492

Black portions are continents then known to exist. Dotted lines show the undiscovered Americas

2. In August, 1492, Columbus sailed from Palos, Spain, with three small caravels, the *Santa Maria*, the *Pinta* and

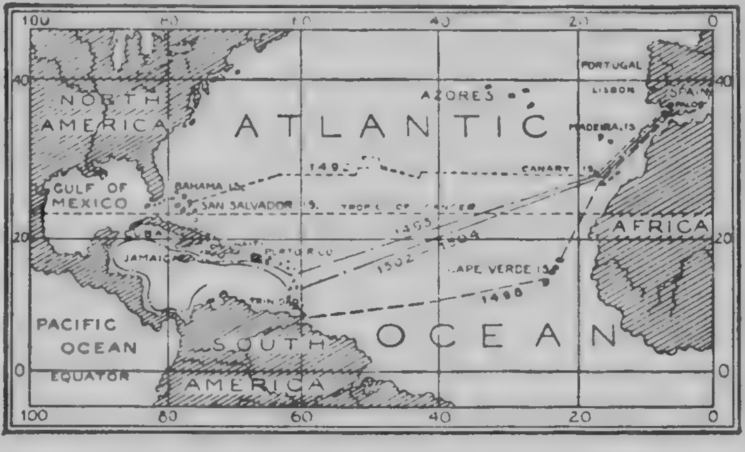
the *Nina*. His crew was made up of ninety men, many of them going under protest, as they had no faith in the undertaking. He ran south about forty-five miles and stood for the Canaries. Following Toscanelli's map, Columbus was aiming for the northern coast of Cipango.

For two months these tiny vessels pushed westward. The sailors were afraid as the distance from Spain increased. The Sargasso Sea, a vast body of vegetation growing on water some two thousand feet deep, increased their fears. The trade winds which carried them rapidly westward might prevent their return. They begged Columbus to carry them home, but he insisted upon pushing on. Finally signs of land were seen, and on the morning of October 12, land was sighted.

Columbus with part of his company went ashore. The landscape was beautiful. This was, doubtless, Cipango, and all were wild with joy at reaching the country sought. Visions of great fortunes delighted them. The officers embraced Columbus and the sailors begged his pardon for doubting him.

The natives were unlike any people the Spaniards had seen. They were brown in color and naked. There were no signs of the great wealth expected in Cipango except the trinkets of gold worn by the natives. When asked where they found the gold they pointed southward. Columbus decided that he had landed on an island north of Cipango. He had heard of the many islands in the Indian sea. This was one of them, and the natives were, therefore, Indians. He took possession in the name of Castile and named the island San Salvador. It was one of the Bahamas, but which one cannot be determined.

After cruising among the Bahamas for about ten days, Columbus was convinced that he was east of Cathay. He decided to proceed to Cipango and thence to Cathay. Sailing southward he reached Cuba. The tropical climate, the beautiful scenery, and the pearl oysters along the coast corresponded to the descriptions of Marco Polo, but no great cities could be found. From Cuba he sailed to Hayti and called it Hispaniola. Here one of his ships was wrecked and he decided to return to Spain. Pinzon, who commanded the *Nina*, had deserted, and the *Pinta* was too small to carry all the men. As many of the men were pleased with the country, the climate and the natives, a colony was planned. A blockhouse was built of the wreck of the *Santa Maria*, and forty men with provisions for one year were left in charge. The colony was named La Navidad.



ROUTES OF COLUMBUS IN HIS VARIOUS VOYAGES

The return voyage was stormy, and it was March before Columbus reached Palos. Great honors were showered upon the returned wanderer. The specimens of gold and pearls that he brought back convinced all that a country of great wealth had been discovered. There was little doubt that the island now known as Cuba was the eastern extremity of Cathay, and Hispaniola was the northern part of Cipango. A short route had been found to these famed lands, and it was easy to get money for another voyage.

3. In September Columbus sailed with seventeen ships and 1,500 men. All sorts of animals—horses, mules and cattle—were put on board, also vines, sugar cane, and various

seeds. Many adventurous young men of the nobility joined the party, interested in the wealth of the Indies. At the Canaries, goats, sheep, pigs, fowls, seeds of oranges and lemons were added to the cargo. The new colonies were to be well provided for. On the third of November they saw a small island which they named Dominica. Later they stopped at an island which they called Porto Rico. It was the twenty-seventh of November when they reached La Navidad, the colony left on Hispaniola. The fort and its occupants had disappeared. No traces of the missing men were ever discovered.

A new colony was founded, and named San Domingo. Twelve ships were sent back for supplies. Columbus, with 400 men, explored the interior. No cities were found, but many signs of gold mines encouraged the explorers.

In April Columbus left the colony with three caravels to explore the coast. He went to Cuba, which he supposed was the Asiatic coast. Before following the coast he thought it better to go south, as the natives, when asked about gold, always pointed south. He found an island still called by the native name of Jamaica. The Indians here were the most intelligent he had seen. Turning north again he followed the Cuban coast for some distance, but no cities were found and his crew insisted upon returning to Hispaniola.

Columbus was worn out with fatigue and excitement. The colonists were discontented and mutinous. After more than a year of hard work in an attempt to bring affairs to order he returned in 1496 to Spain. He was kindly received by the queen, and in the spring of 1498 he started upon his third voyage. He was provided with six ships and 200 passengers. He sent three ships direct to Hispaniola, and with the others he sailed southwest, intending to reach Cathay at a more southerly point. In July he was five degrees from the equator, and was for a time becalmed. Fortunately the equatorial current carried the ships slowly to the zone of trade winds and in about ten days land was sighted. It was an island with three mountains, and Columbus called it Trinidad. He sailed around it and entered a gulf where he was almost overwhelmed by the rush of waters from a great river. This river was the Orinoco. If this was a continuation of the coast of Cuba or Cathay, as he supposed, it probably was separated from the northern parts by a strait which led into the Indian Ocean. He turned north to find this strait

As he sailed around the Pearl Coast he was mightily pleased with the beautiful pearls found there. This was more like the Cathay he was looking for, and he doubtless would have been disappointed if he had realized that he had discovered a new continent. He was suffering with gout and his eyes were exhausted with watching coast lines. He thought it best to return to Hispaniola.

San Domingo was reached in August. Here an insurrection had taken place. This was hardly suppressed when a new governor was sent out to take charge if things were not satisfactory. He promptly put Columbus and his brother in chains and sent them to Spain. Isabella was much grieved over the treatment Columbus had received, and promised recompense for his losses and invited him to undertake another voyage. In May, 1502, he sailed with four small caravels and 150 men.

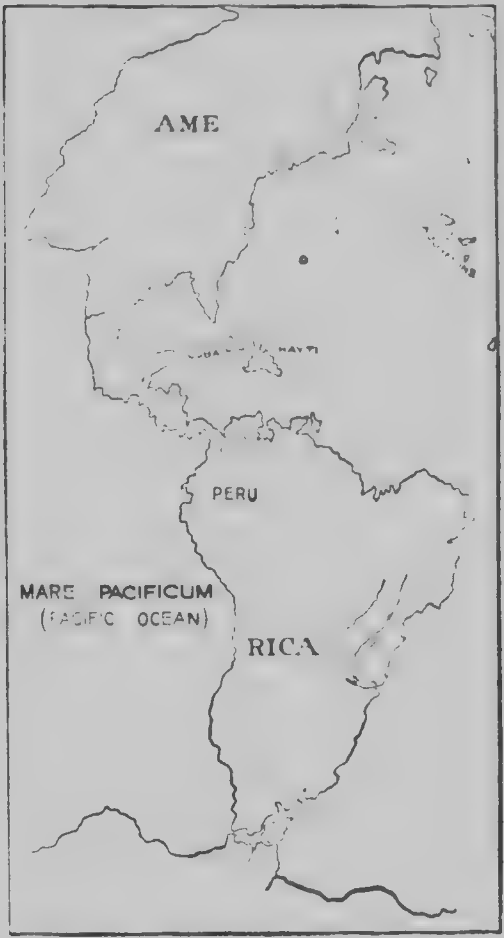
Following the route of his second voyage he passed near Dominica and steered for Jamaica. He wished to avoid San Domingo, as his enemies were still in possession of that place. However, one of his ships was disabled and he stopped at San Domingo to replace it. He was refused entrance to the harbor. As his practiced eyes had seen signs of an approaching storm, he begged permission to stay in the harbor and advised the commander of a fleet of twenty ships on their way to Spain, laden with gold, to remain until the storm was past. His request was not granted nor his advice taken. While he found shelter from the hurricane which swept the island in a smaller harbor, the fleet was almost destroyed. Only one vessel reached Spain and that contained 4,000 pieces of gold intended for Columbus.

Pushing on after the storm, he sailed in a southwesterly direction and in a short time reached Honduras. Now it seemed that Cathay had been reached, for here he found a semi-civilized people who wore cotton clothes of beautiful color and texture, who had copper knives and hatchets, and handsome gold ornaments, and artistic pottery. They lived in great houses of stone and lime, whose walls were decorated with carvings and pictures. Columbus sailed southward along the coast to find a passage to the great sea to the west which the natives told him about. They spoke of a narrow place and Columbus thought it was water. They doubtless meant the Isthmus of Darien.

At the beginning of December no strait was found, but Columbus decided to make a settlement as a base for the working of gold mines in the neighborhood. Three months of suffering followed, as supplies were short and the natives hostile. It was necessary to sail for home. At Jamaica the ships were wrecked. Two men were sent to San Domingo for aid while Columbus and his crew built a rude fortress from the wrecked vessels. It was almost a year before his enemies sent for him. Worn out with his sufferings he sailed for Spain as soon as possible. Nineteen days after he reached Seville his best friend, Queen Isabella, died. The government made no effort to aid him in carrying on his explorations. He retired to Valladolid, where he died in extreme poverty in 1506. He died without knowing that he had discovered a new continent, and disappointed that he had not found the water-way to the Indies.

4. In 1497 a Portuguese navigator, Vasco da Gama, following the path of Diaz around Africa, reached Cathay or China. When he returned in 1499 he brought a cargo of spices, rare silks and precious jewels. Portugal had accomplished what Spain had tried in vain to do, and as yet the great work done by Columbus was not apparent.

Other voyagers tried to carry out Columbus' plan of reaching the Indian Ocean by sailing westward. A Florentine navigator, Americus Vespucius, made several voyages in the period between 1497 and 1507. He explored much of the coast of South America and that of North America as far north as Florida. As no passage to the ocean beyond was found it became evident that a new country had been discovered. As he was the first to make this clear to the learned men of Europe, his name was given to the new continent.



MAP MADE SOON AFTER 1500

Showing rapid increase in knowledge of world geography after the voyages of Columbus

5. What Columbus tried to do was accomplished later by a daring navigator named Magellan. As a young man he had been in India with the Portuguese viceroy, for Portugal claimed India after Da Gama's voyage. He returned home in 1512 and devoted much time to the study of navigation. It seemed to him that it would be possible to reach India by a westward route, and he presented his plan to the king of Portugal, who was not

interested. As the Spaniards were not permitted by the Portuguese to use the route by way of Good Hope, an opening to the west was desirable. So the king of Spain, when Magellan appealed to him, provided five small ships and a motley crew made up of many nations. They sailed in September, 1519.

In spite of storms, leaky ships and poor food, Magellan pushed across the ocean to the coast of Brazil. Following the coast southward he reached the La Plata River which he explored far enough to find it was not a strait. It was now January, 1520, but he pushed on to the south until the weather became so cold that he was compelled to stop in a sheltered port at St. Julien. Here a mutiny broke out, but it was skilfully quelled by this masterful leader. It was August before the journey was continued. In October he reached the strait now known as Magellan, and sailing through it entered the mighty ocean which he called Pacific because it seemed so peaceful after the storms through which they had passed. Then began a voyage across its broad waters unequalled in daring and suffering. It was March, 1521, when he arrived at the Philippine Islands, and Magellan learned with joy that the Moluccas were but a short distance to the south. He was now in known waters and hoped soon to be with his friends. The Philippines were claimed for Spain and remained a Spanish possession until some four hundred years later, when they were turned over to the United States. A short stop was made upon the island, and in a skirmish with the natives Magellan was killed. His ships sailed on through the Indian Ocean and around the coast of Africa to Spain, and completed the first circumnavigation of the globe.

6. Magellan completed the purpose of Columbus by reaching the East Indies from Europe by sailing westward. Later explorers like d'Ayllon and Henry Hudson tried to find a westward passage to the Pacific through North America. The northwest passage around North America was finally discovered by Sir Robert McClure in 1854, but it proved of no value for shipping.

During the century that followed Columbus, the great continents of North and South America were definitely located, and it became evident that there was no good sea-going passage to the Pacific from the Atlantic. For a long time the route from Europe around southern Africa was the best.

7. The old problem of a shorter passage to the Indies was still unsolved and was now taken up by the engineers and canal builders. If no ocean passage could be found, perhaps one could be made through the isthmuses. During the last century skilful engineers have worked out the problem that puzzled Columbus and other navigators. In 1869, a canal was completed through the Isthmus of Suez, connecting the Mediterranean and Red Seas, and reducing the distance between Europe and the far East by about 5,000 miles. In 1881 the successful engineer De Lesseps, who built the Suez Canal, began the project of a canal through the Isthmus of Panama. Too many difficulties were met here, and the plan was given up by the French, who were supporting it. The government of the United States bought up the rights of the French and is nearing what promises to be a successful completion of the canal. It is estimated that it will be open to ocean vessels in about 1913. This will shorten the distance by water from New York to San Francisco about 8,000 miles.

It has required more than four hundred years of exploration and commercial development to work out to final completion the purpose with which Columbus started out on his famous voyage in 1492.

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45. Type Study on the Iroquois Indians

Suggestions as to Method

(*a*) A full appreciation of the Iroquois and of their activities in war requires a geographical survey of a large part of the United States, especially of the regions east of the Mississippi River, the Great Lakes and Canada.

(*b*) A good historical map of the various Indian tribes shown in different colors is desirable and the children should be drilled upon the main groupings of tribes, with definite relation to the present divisions into provinces and states.

(*c*) One of the best map studies in connection with Iroquois history is to show how the Iroquois war-parties could start from central New York and follow the streams in all directions in their canoe journeys, as down the Susquehanna, Delaware and Allegheny, or along the Great Lakes and their tributary streams westward, or down the St. Lawrence eastward, or along the Mohawk and Lake Champlain to the east and north.

(*d*) A collection of pictures of Indian houses, dress, war dances, hunting parties and battles can be made. When museums can be visited, as the Victoria Museum in Ottawa, or collections of Indian relics can be seen, they will greatly aid the concrete and realistic comprehension of Indian life.

(*e*) We have numerous books and stories of the long conflict between the whites and the Indians, of adventure and bold exploits, which can be read in suitable references. They are also well illustrated with maps and pictures.

Outline of Topics

1. The Five Nations and their location in Central New York; their early history.
2. Their relation to Champlain, the French and Algonquins.
3. Their dealings with the Dutch.
4. Their home life and tribal organization.
5. Their conquests, north, east, south and west.
6. French and English influences
7. Their connection with the French and Indian War, and with the Revolution.
8. Their leaders.
9. Comparison with other Indians.
10. Conclusion and summary.

IROQUOIS INDIANS

1. The Iroquois Indians, the craftiest, the most daring, and the most intelligent of all the barbarous tribes in North America, lived in New York State. Their territory extended from Lake Erie to the Hudson River, and was bounded on the north by Lake Ontario and the upper St. Lawrence. To the south it reached Chesapeake Bay. This was a commanding position, as it controlled the waterways of the Great Lakes, the Hudson River, and through the Susquehanna and the Allegheny rivers, the country to the south. It was easy for war parties, with the light canoes which could be carried over portages, to reach, quietly and secretly, far-distant places, and no enemy was safe from these bold warriors.

TYPE OF AMERICAN INDIAN

2. The Iroquois traditions say that they once controlled the whole of the St. Lawrence River. The great village of Hochelaga which Cartier found where Montreal now stands, when he explored the St. Lawrence in 1535, was theirs. The Algonquin Indians, their ancient enemy, drove them from the St. Lawrence to the south and west. Through the influence of a great chieftain, Hiawatha, the tribes south of Lake Erie formed a confederacy of five tribes or nations—the Mohawks, the Oneidas, the Onondagas, the Cayugas and the Senecas. The French gave them the name Iroquois.

They called themselves an Indian term which meant "Men of the Long House," from their peculiar style of house or wigwam. The early settlers spoke of them as the Five Nations.

There were other tribes of Iroquois which declined entering the confederacy. The Hurons, on Lake Huron; the Eries, south of Lake Erie; the Andastes or Conestagas, in the valley of the Susquehanna; and the Cherokees and Tuscaroras of Tennessee and Carolina, though of kindred blood, were looked upon as enemies by the haughty tribes of the Five Nations and were in time either exterminated by them or adopted into their tribes. In the early part of the eighteenth century the Tuscaroras, defeated by their white neighbors, came north and were adopted as a nation by their Iroquois kindred. From that time on the confederacy was known as the Six Nations.

When the French came to settle the country of the St. Lawrence, they found the Algonquin Indians along its banks. They soon made friends of their neighbors. Their attempts to carry on a trade in furs with the Indians in the far west were not very successful because the traders were so often beset by prowling bands of Iroquois. When in 1609 Champlain was invited to join a war party of Algonquins and Hurons against their common enemy, it seemed to him a fine chance to explore the country to the south with protection from the troublesome Iroquois. With the Indians he proceeded down the Richelieu River to the Iroquois Lake which now bears his name, and in the neighborhood of Ticonderoga they came upon a war party of their enemy. The Iroquois threw up a barricade and waited for the attack. The Indian allies rushed boldly to the enemy, but were repulsed and ran back howling for help from Champlain and the two Frenchmen who were with him. The Iroquois, who had sallied forth after the retreating foe, were amazed to see three white men clad in shining armor advancing toward them. When Champlain raised his arquebus and killed three warriors, the unusual experience was too much for the bold Mohawks and they turned and fled. The Algonquins took many prisoners.

In spite of Champlain's protest many were put to torture. This affront to the Men of the Long House was never forgiven, and the French this day made an enemy that placed a barrier between them and the country to the south which they hoped to possess.

3. It was in the summer of 1609 that Hendrick Hudson sailed up the Hudson River. Later the Dutch settled the New Netherlands, and soon after, Dutch traders were changing with the Five Nations blue beads and red cloth for skins of beaver, mink and otter. As the settlers increased in number and pushed up the Hudson, the principal chiefs of the Five Nations were invited to Fort Nassau and a solemn treaty was made by which the Dutch agreed to supply the Indians with guns and ammunition in exchange for peltries. From this time on the Iroquois were more or less steadfast friends of the Dutch and later transferred their friendship to the English when New Amsterdam became New York. This treaty was made in 1618.

4. The strength of the Iroquois depended not only upon their favorable location and their native intelligence, energy and ambition, but also upon their plan of government. Each tribe had its own laws and its own sachems or principal chieftains who were helped by numerous subordinate chiefs and principal men. But when matters of general importance came before them, they were looked after by an assembly of the chiefs of all the tribes. The general assembly was held at a great council house in the valley of Onondaga which was centrally located, and then Hiawatha and the other great chieftain who helped him to carry out his plans belonged to the Onondaga tribe. At this council house ambassadors from other tribes, or from the white men, were received, alliances were made, and all subjects of general interest talked over. Here their orators, who were held in great esteem, often had much influence in deciding important matters. If anyone rose to speak, all others kept profound silence.

Besides the tribal divisions there was a family or clan organization. The emblem of each clan was some animal.

as wolf, turtle or bear. There were eight of these families, and they were scattered among all the tribes. This was a great help in preserving unity among the tribes, for each member was bound to aid all others of his own clan.

The Five Nations were not migratory like many other savages. They possessed walled towns which were surrounded by cultivated fields where they grew corn, pumpkins and beans. Their houses were often one hundred feet long and perhaps fifteen or seventeen feet wide. They were built of poles covered with bark. Through the center was a passageway about six feet wide, and at intervals were stone fireplaces, one for each family. Above each fireplace there was an opening in the roof to let out the smoke. On each side of the passageway bunks or stalls were built. Here, upon piles of skins, the families slept. There was a door at each end of the passage, hung with skins to keep out the cold. As many as twenty families lived in such a house.

AN IROQUOIS LONG HOUSE

In the winter the Indians would sit or lie around the fires, joking and laughing, or perhaps listening to Iroquois legends told by some old orator. Over the fires would be cooking kettles of corn and beans, wild game, or on great occasions, dog meat, and the long house would be filled with the smoke of the fires and tobacco.

Perhaps some warrior would call together a war party, for any warrior had that privilege, and a number would desert the house, and joining some of their neighbors would steal silently through the woods to surprise some unsuspecting enemy. If prisoners were taken they were brought to the village, and in the open square—the long houses were built about a square—awful scenes of cruelty would be seen. The

Iroquois, though more intelligent than other Indians, were not less ferocious. They showed great ingenuity in methods of torture. Men, women and children enjoyed to the utmost the suffering of victims whom they mutilated and burned at the stake, prolonging life as long as possible that the agony might be greater. Then they would cut the bodies of the slain to pieces and often eat them before the surviving prisoners. All prisoners, however, were not put to death, for sometimes, sated with torturing, different members of the tribe would offer to adopt prisoners to take the places of those of their own number who had been slain in battle. In this way they kept up their numbers, for repeated forays cost many lives.

The Men of the Long House were strong and well built. Their faces were hard and stern, for they were taught from childhood to repress all emotions. They were proud and extremely self-reliant. Their self-satisfaction made them unwilling to imitate and so they were hard to educate. They were ambitious and revengeful, treacherous and suspicious. Though brave, they avoided open battle, preferring to fight from ambush. And these tribes who for so many centuries were the terror of their enemies, both Indian and white, never numbered more than four thousand warriors.

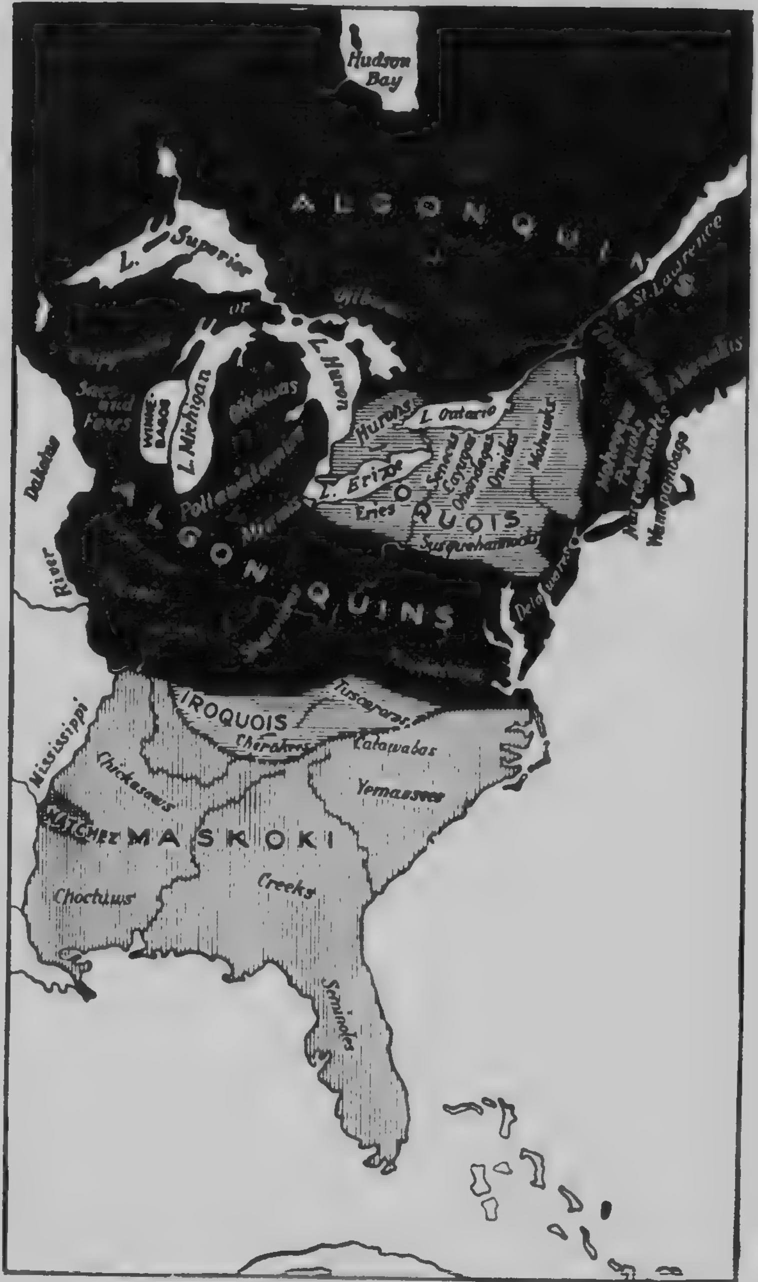
5. The Iroquois waged constant war with the Algonquins and subjugated many tribes. The Algonquins of the north combined with the French made a dangerous enemy. In 1645 a treaty of peace was made with the Five Nations. For a time the French were allowed to push their explorations and settlements to the west and south without much interference.

In 1649 the warriors of the Five Nations grew restless and turned their energies to the conquest of their kindred, the Hurons or Wyandots. In early times these tribes had offended them by refusing to join the confederation, and later, their alliance with the Algonquins and the French against the Men of the Long House made of them the bitterest enemies. Like all of the Iroquois, they had their palisaded villages with the long houses and the cultivated fields. In numbers they probably equaled the Five Nations, but the tribes were not organized. They had always been friendly with the French, and among them the Jesuit missionaries had made many converts.

In the depth of winter, the war parties of the Five Nations crossed the lake and stole quietly through the forests to the country of the Hurons on the shores of Lake Huron. The surprise was complete. The villages were taken and burned, and many of the inhabitants killed or taken prisoner. The few that escaped fled to the French at Quebec, or to the posts at the west. As a nation they were destroyed.

The Neutral Nations, north of Lake Erie, also Iroquois, were the next victims of the invaders. The Eries, another branch of the Iroquois, were attacked and almost destroyed. The few that were left were taken into the Five Nations. Then the victorious enemy threw themselves against the Andastes in the valley of the Susquehanna. These brave tribes were as warlike as their kinsmen, and it took twenty years to conquer them.

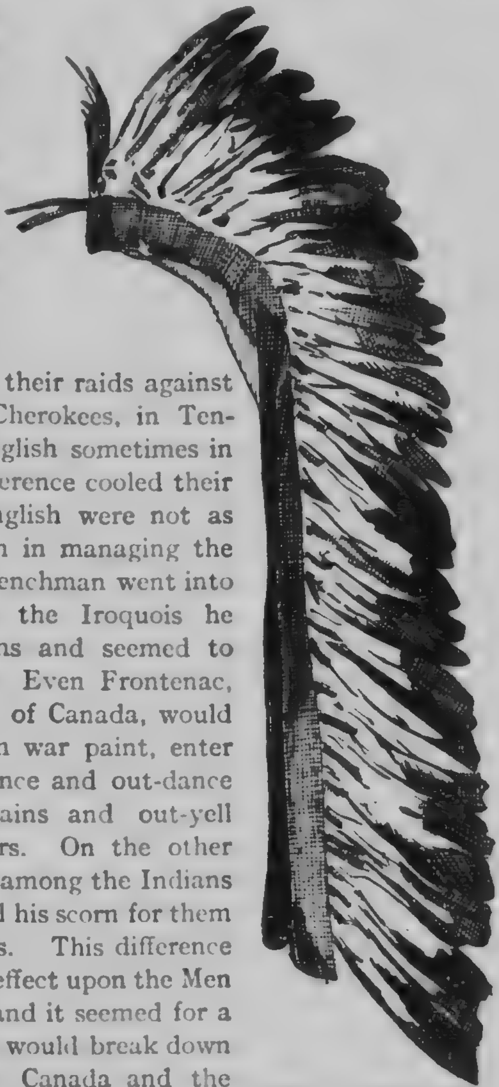
The country was now open to the Algonquins of the southeast, and in a short time the Delawares or Lenape, the principal tribe of the Algonquins, were subdued, their arms were taken from them, and they were called by their haughty conquerors "women," a most humiliating name for warriors. Then the Men of the Long House went to Canada and drove the Ottawas from their country about the river of that name. Forgetting their treaty with the French they harassed their forts and trading posts in the west, and their warwhoop was heard under the walls of Quebec. Frontenac, then governor, and LaSalle, who was pushing his way to the mouth of the Mississippi River, besought the Iroquois to spare their friends, the Illinois Indians, but the thirst for conquest was too great, and a formidable war party paddled down the Illinois River and falling upon the panic-stricken Indians, who had taken refuge upon an island in the river, destroyed the whole tribe. No wonder the Five Nations called themselves "Ongwehonwe" or "the men surpassing all nations." Their inso-



LOCATION OF EARLY INDIAN TRIBES

lence knew no bounds. From Maine to the Mississippi their name brought terror. "I had as lief," writes a French missionary, "be beset by goblins as by the Iroquois. The one are about as invisible as the other."

6. The Iroquois of the Five Nations, in their raids against their kinsmen, the Cherokees, in Tennessee, found the English sometimes in their way, and interference cooled their friendship. The English were not as skilful as the French in managing the Indians. When a Frenchman went into the wilderness with the Iroquois he adopted their customs and seemed to enjoy the wild life. Even Frontenac, when first governor of Canada, would besmear himself with war paint, enter the Iroquois war dance and out-dance their greatest chieftains and out-yell their bravest warriors. On the other hand an Englishman among the Indians could scarcely conceal his scorn for them and their foolish rites. This difference in treatment had its effect upon the Men of the Long House, and it seemed for a time that the French would break down the barrier between Canada and the much-desired country of the Ohio.



INDIAN HEADDRESS
Part of the regalia of war

But the Five Nations could not always forget their ancient wrongs, and still hoped to drive away the people who crowded them so closely. Their forays against the French were renewed. In 1696, Frontenac, though an old man, was again sent to govern Canada. At the head of an army of French regulars all in full uniform, with drums beating, trumpets blowing, and colors flying, followed by hordes of his Indian allies hideous in war paint and adorned with scalp locks, he marched through the country of the Iroquois. The awed barbarians retreated before him, and destroying the empty wigwams and deserted fields he returned to Canada.

Greatly weakened by this invasion the Five Nations decided that they could not drive the French away. As they must live as neighbors it might be better to accept their friendship, and soon Iroquois chiefs were exchanging visits with the French. When a party of Indians visited a French fort they were greeted with the firing of cannon and the beating of drums. The chiefs were feasted with the officers, and presents of uniforms and French flags were given them.

7. When the French and Indian War began, the English were doubtful about the friendship of the Iroquois. Fortunately for the English, Sir William Johnson was able to influence them to help the British army. Some twenty years before the war, William Johnson, a young Irishman, had settled in the valley of the Mohawk. He became rich through the fur trade, and was liked so much by the Mohawks that they looked upon him as a chief. He built two fortified mansions in the valley, and his houses were always open to his Indian friends. He was for a long time superintendent of Indian affairs and successfully controlled these treacherous people in the interests of the English.

When war was threatened between the colonists and the mother country, Johnson was uncertain whether he should cast his lot with England or with the people among whom he had so long made his home. In 1774, before fighting began, he died. The Iroquois, led by the great Mohawk chieftain Joseph Brant, or Thayendanega, fought for the English. They did cruel work in the war, taking an active part in the massacre of Colonel Herkimer and his brave men at Fort Stanwix in New York, and in the atrocities of Wyoming and Cherry Valley. Their insolence became so great and their cruelties so unbearable that a special army was sent against them. In 1779. General Sullivan with five thousand men invaded the territory of the Iroquois and routed them and their Tory allies near the present town of Elmira. The villages and crops of the Cayugas and Senecas were destroyed.

This was a crushing blow, and their suffering during a cold winter which followed was severe. But the Men of the Long House were undaunted, and among other cruelties they almost destroyed a tribe of their own nation, the Oneidas, who had remained neutral during the war. From the English post at Niagara and other strongholds in Canada they continued their depredations for some time. But the glory of the Six Nations was past, and it is only as scattered tribes that they exist today.

8. The leaders among the Iroquois were noted for sagacity, courage and oratory. Among their wise chieftains was Hiawatha, who brought the "gift of peace" and united the Five Nations. One of the bravest was Joseph Brant, or Thayendanega, who took such an active part in the Revolutionary War. When a young boy this Mohawk chieftain attracted the attention of Sir William Johnson. Believing that the Indians could be educated and civilized, Johnson sent the boy to school, where he learned to use the English language and got a knowledge of general history and literature. He became a member of the Episcopal church and was for a time a missionary among the Mohawks. But he was none the less an Indian, and in the accomplishments of an Indian brave he could outshine all his fellows. It is claimed that his civilization was real enough to cause him to object to the torturing of prisoners.

Among the Iroquois the orator was as much esteemed as the warrior, and had as much influence in directing affairs. Many speeches of these orators have been preserved in history, and clever speeches they are. One of the most famous is that of Red Jacket at Buffalo. Logan, a Cayuga chief, was also an orator. He lived in close friendship with the English in Pennsylvania for many years, but when his family was killed by some rough frontiersmen, he became a bitter enemy.

9. While the Iroquois tribes led in intelligence they were by no means the greatest in numbers. The Algonquins included tribes from the Atlantic to the Mississippi and from Hudson Bay beyond the mouth of Chesapeake Bay. Among these were the Powhatans of Virginia, the Mohicans of New England, the Lenape of Delaware, the Miamis and Shawnees of Ohio, the Illinois, and the Pottawatomies, Ottawas, Chippewas, and Sacs and Foxes of the country around the Great Lakes. One tribe the Blackfeet, was found beyond the Mississippi. These tribes varied in habits and intelligence. The tribes of the east were partly agricultural and, like the Iroquois, had settled homes. Their houses were not as well built and were small and circular in shape. They were more easily influenced by the colonists, and the missionaries made more converts among them than among the Iroquois. They were not united and were easily subdued by their warlike neighbors. There were, however, many brave chieftains among them. Pontiac, who led the attacks upon the English forts upon the lakes just after the French and Indian War, was an Ottawa, and he showed considerable generalship. Tecumseh was a Shawnee chief, and Blackhawk, a chief of the Sacs and Foxes.

The Southern Indians were known as the Maskoki, and included the Creeks, the Chickasaws, the Choctaws, the Seminoles, and a few other tribes. Their territory extended from the Atlantic to the Mississippi, and on the south to the Gulf of Mexico. Like the Iroquois they were a nation of warriors and lived in settled towns in well-constructed houses. Though good fighters, they had not the desire for conquest that characterized the Iroquois. They differed from the northern Indians in religion, being fireworshipers like the Indians of Mexico.

AMERICAN INDIANS

West of the Mississippi, the most important tribes were those of the Sioux or Dakotas. These are tall, well-built Indians with many of the characteristics of the Iroquois. Like them, they were brave and warlike. The sun dance, which has been forbidden by the government, is one of their religious rites in worship of the sun. Many of the Sioux still live in the Dakotas and parts of Minnesota. Some of the allied tribes are the Winnebagos, the Mandans and the Omahas.

The Pani, or Pawnees, were an important tribe west of the Mississippi. They were an agricultural people, but also hunters of buffalo. They made a rude kind of pottery like the nations of the south and it is supposed that they came up from Mexico. Like the Aztecs they made sacrifices of human beings in their religious rites. Their home was in Nebraska, but the remnant of the tribe lives now in Oklahoma.

There were numerous small tribes of Indians west of the Rocky Mountains but none of marked importance. Most of them were small in stature and stupid in intellect, very unlike the tribes of the east. They were remarkably skilful in making baskets.

In New Mexico, Arizona, parts of Colorado and Utah, there lived some semi-civilized tribes of Indians known as Pueblos and Cliff Dwellers. The Pueblos built large houses of stone and adobe in which many families lived. The cliff dwellings were built on ledges of rock along the sides of cliffs. Like the dwellings of the Pueblos they contained many rooms and many people. They were probably built for defence, as neighboring tribes of savages like the Apache Indians made frequent attacks upon them. These people made artistic pottery and baskets, and wove beautiful blankets. They were far in advance of even the best of the Iroquois in civilization, and closely resembled the Aztecs of Mexico.

10. The Iroquois tribes, as above described, display the strong Indian traits in more marked fashion than any other American tribes. They are remarkably brave and reckless fighters, full of the spirit of conquest over their neighbors,

and intensely cruel and relentless in their pursuit of their foes. Physically they possessed fine, commanding forms, great personal prowess, marvelous endurance and persistence in their peculiar style of warfare, and in many cases, remarkable skill in oratory. As a group of related tribes they had more capacity for organization than any other Indians, but they were not capable of adopting civilized modes of life. They had a boundless pride in themselves and in their own mode of life, and little power to imitate and take on the superior customs and ideas of the white race. The other Indian tribes of North America possessed in a less marked degree the characteristics of the Iroquois.

Historically the Iroquois confederation of Indian tribes had a powerful influence upon the early settlement and development of the country. For two centuries they held central New York, hindering the French from developing strongly along the Ohio and even on the Great Lakes. By holding central New York, they also prevented the English from settling that part of the state and from moving westward. But at the close of the Revolution when the power of the Iroquois was finally broken, the English filled up central New York and then moved westward along the Great Lakes.

In the westward movement of the pioneers and settlers the various Indian tribes all the way from Alabama and Georgia to New York resisted the whites in a way similar to the Iroquois, but one after another their tribes and confederacies were compelled to give way before the superior power of the whites.

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46 Type Study on the Puritans

Suggestions as to Method

(a) In the first part of this topic the political and religious conditions in England will need to be understood. The fuller details of the hardships of the Pilgrims in their removal to Holland and of their voyage and landing are found in the larger histories and reference books.

(b) The political situation of the Puritans under James I and their successful effort to secure a charter are important and require fuller elaboration.

(c) Notice that the Puritans about Boston and New England settled by congregations, led by their favorite pastors. The separate church and town meeting naturally resulted

(d) The organization of representative government, while natural, needs special attention and discussion

(e) The disposition of the Puritans to keep splitting off from the mother church gives special emphasis to their character as separatists. Most of the New England colonies were formed by congregations which separated themselves from the leaders about Boston

(f) All the leaders in early New England settlements are strong characters for study. Compare them with each other and with later leaders like William Penn, Oglethorpe, etc

(g) Study the source books, like those of Hart, for lively pictures of manners and customs.

Outline of Topics

1. The rise of the Puritans in England.
2. The Pilgrims in Holland and the journey to America.
3. Their landing and experiences at Plymouth.
4. The large migrations of the Puritans to Salem, Boston, etc. Endicott, Winthrop and Dudley as leaders.
5. The first assembly. Representatives in the general court.
6. Organization of the congregational churches. The town meeting.
7. Rapid growth in number of towns and population. Roads and bridges. Schools. Harvard University
8. Effort to take away the charter. Strong opposition.
9. Roger Williams. Anne Hutchinson

10. Sir Henry Vane.

11. Founding of Connecticut. The younger Winthrop.

12. Thomas Hooker and the founding of Hartford.

13. The Pequot War. John Mason.

14. Founding of New Haven. John Davenport. Union of towns. Connecticut Blue Laws.

15. Union of the colonies in 1643.

16. End of the Puritan migration in 1640. Later growth of New England.

17. Character of the Puritans in New England.

THE PURITANS

1. The Protestant reformation in England which began during the reign of Henry VIII was secured by the defeat of the Spanish Armada in 1588. Then it was found that there were dissensions in what had become the church of England. Some Protestants were not satisfied with the established church and desired further reforms. Many of these reformers were followers of Wiclif, the great English Protestant, while others had been influenced by John Calvin, when, during the persecutions of Mary's reign, they fled to Switzerland. They wished to simplify religious forms and ceremonies, or as one of their critics said, they wished to make it a "church of purity," hence the name Puritan.

2. The Puritans, generally, wished not to leave the established church but to reform it. During the reigns of Elizabeth and James I, some of the Puritan ministers concluded that these reforms could never be effected and they separated from the church and held services in private houses. All that held to this practice became known as separatists and were persecuted as heretics. Many fled to Holland in 1608 and located at Leyden. They did not like the idea of bringing up their children in a foreign land where they might forget their mother tongue, and after ten years decided to go to America.

A grant was obtained from the London Company and the Puritans asked King James for a charter. This he refused.

but raised no objection to their going. On the 16th of September, 1620, the Mayflower left Plymouth with one hundred passengers. They planned to go to New Jersey, but the ship was carried out of its course and they finally landed at a place called, on John Smith's map of this coast, Plymouth. Their leaders were William Brewster, William Bradford, John Carver and Miles Standish.

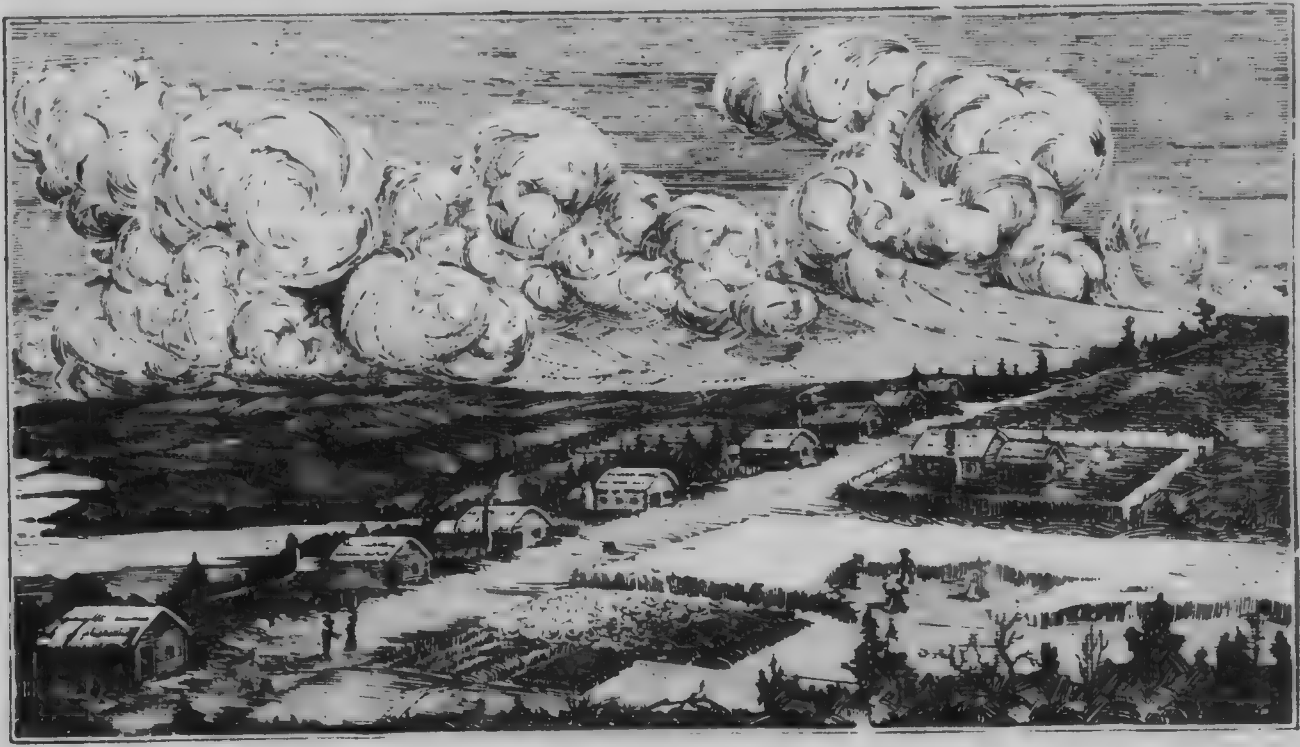
THE CHURCH AT DELFTHAVEN
Where the Pilgrim Fathers held their last service in Holland

3. It was the 21st of December when the Pilgrims landed, and the ground was covered with snow. It was impossible to get suitable protection from the weather, and they suffered

from cold as well as from lack of food. This first winter more than half of their number died. They were not discouraged, however, for as Brewster said, "It is not with us as with men whom small things can discourage or small discontentments cause to wish themselves at home again." A platform was built on the nearest hill and manned with a few cannon as protection against the Indians. During the first summer this platform became a fortress. A treaty with Massasoit, chief of the nearest tribes, the Wampanoags, was made, and for a long time the settlers were not disturbed by Indians. As their settlement was not within the province of the London Company they obtained another grant from the Plymouth Company. At the end of the first summer they had cleared enough land to furnish a plentiful harvest and Governor Bradford appointed a day of Thanksgiving. After ten years they numbered only three hundred. In 1630 their numbers were greatly increased, and in 1670 the population of Plymouth Colony was about 8,000, and was distributed among twenty towns.

4. Among the Puritans in England were many men of wealth, culture and high social position. These men became interested in colonizing New England and purchased a large tract of land from the Plymouth Company. As Charles I was rather glad to be rid of them he readily granted a charter which incorporated them as the Massachusetts Bay Company. In 1629 the Company decided to take its charter to New England and found a self-governing community there.

John Endicott had been sent over with some sixty men in 1628, and had settled at a place a short distance from Plymouth which he called Salem. A tract of land had been obtained which next year was included in the grant of the Massachusetts Bay Colony. In 1630 John Winthrop, a wealthy gentleman from Groton in Suffolk, was chosen governor for the company. Winthrop was a man of unusual talents. He had the same power of winning confidence and respect that made Washington so remarkable. While he was a stanch Puritan, he was a liberal one, and a marked con-



APPEARANCE OF PLYMOUTH COLONY IN ITS SECOND YEAR

The house of Governor Bradford is within the stockade trast to the deputy-governor, Dudley. Thomas Dudley belonged to an ancient noble family of England. His Puritanism was bleak and stern, and he was not remarkable for Christian charity.

Charles I was governing England without a Parliament, and the outlook for the Puritans at home was dark. With two such eminent men as Winthrop and Dudley at the head of a colony many were attracted to the scheme, and when Winthrop came to Salem in 1630 he brought nearly a thousand people with him. Colonies were made at Dorchester, Roxbury, Charlestown and Watertown. Governor Winthrop made his headquarters first at Charlestown, then moved to a hilly peninsula where the highest hill was crowned with three summits. The English called this Trimountain or Tremont, but the name was later changed to Boston, the name of a town in England from which many of the colonists came.

5. Public business was at first carried on by an assembly of all freemen in the colony meeting four times a year. But the number of colonists increased so rapidly that this plan was not practicable, and representatives were elected by the colonists for a general court. At first the deputies sat in the same chamber with the Board of Assistants who were elected by the Company, but in 1644 they were formed into a second chamber with increased powers. This was the beginning of our present form of government.

6. When the Puritans first came to New England they were not separated from the Church of England, but such a separation soon was made. The Episcopal service was simplified, much of it was discarded, and the first congregational church was established. Two men who insisted upon Episcopal forms were sent back to England. It was decreed that "no man shall be admitted to the freedom of this body politic but such as are members of some of the churches within the limits of the same." There were no bishops in the new organization. Each church formed a parish. As at first each town had but one church, the inhabitants of a town and the church congregation were the same people.

From a painting by Boughton

PURITANS GOING TO CHURCH

When settlers came over from England they were usually led by a minister and settled together in parishes or townships. The church was the meeting-place for business as well as religious services, and was called the meeting-house. Later town halls were built. The meeting-house and the town hall usually stood beside a large grazing-ground or common. On or near the common was often placed a substantial block-house where all could find refuge in case of attacks of Indians.

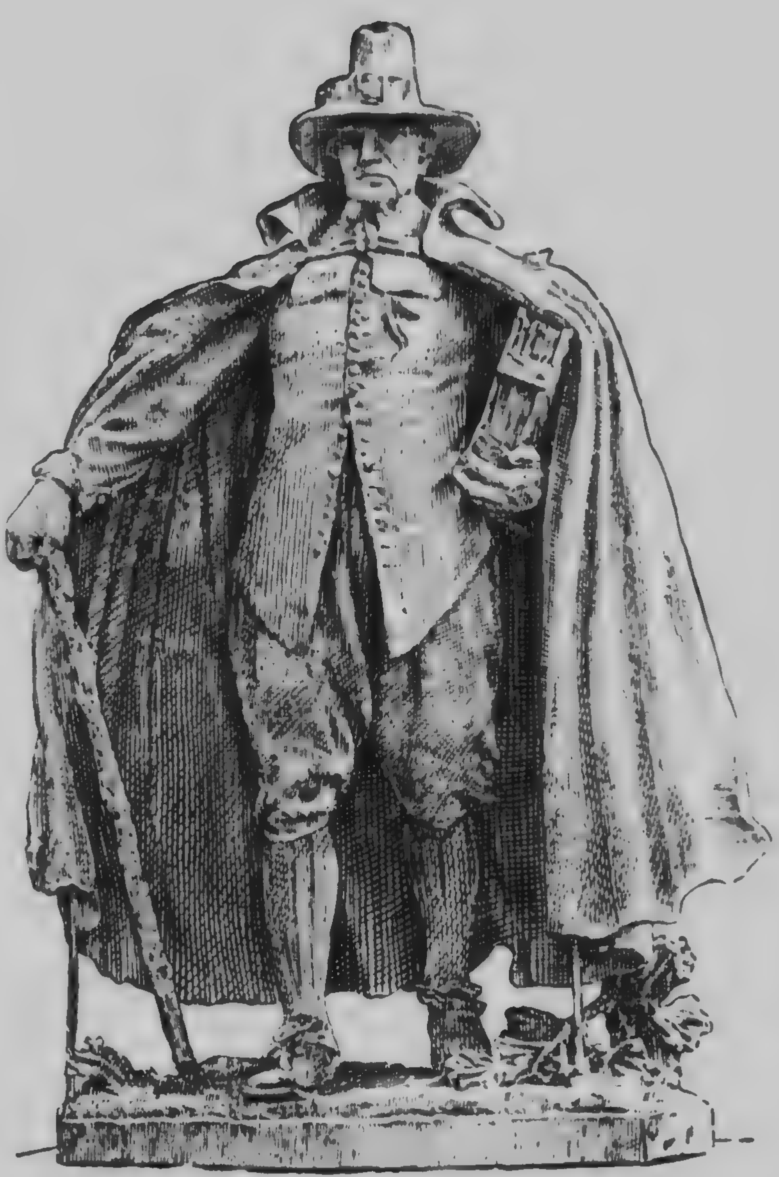
7. By 1634 nearly 4,000 settlers had arrived and about twenty villages had been founded. Permanent houses, roads, fences and bridges were built. In exchange for manufactured articles the colonists sent lumber, furs and salted fish to England. Several thousand goats and cattle grazed in the pastures, and pigs rooted in the clearings and helped to make the land ready for the plow. The interests of education were not neglected. Common schools were started in all the towns. So many of the Puritans were university men, mostly from Cambridge, that a university was considered indispensable. One of the most distinguished of the university men was John Cotton, who had left a magnificent parish in England to hold service in a rude meeting-house in Boston. Thomas Hooker and John Harvard were noted university men. The general court gave four hundred pounds to establish a university. John Harvard of Charlestown, dying childless, left his books and half of his estate to the new college. This college had been established at Newtown, about three miles from Boston. The name of the town was changed to Cambridge and the college was called Harvard.

8. About this time the colony was threatened with the loss of its charter. An attempt was made to seize the charter of the Massachusetts Bay Colony and divide the land up among some half-dozen noblemen. The colonists decided to offer armed resistance. Forts were built about Boston Harbor, the militia was put in training, and a beacon light was set on the highest hill to give warning if an enemy should appear. Affairs in England soon took all the attention of the king, and Massachusetts was for the time forgotten.

9. Among the noted men who came over in 1631 was Roger Williams, one of the noblest men of the time. He was a graduate of Cambridge, and had taken orders in England. Becoming a Puritan, he came to Salem, where in 1633 he was made pastor. He believed in religious liberty, in the entire separation of church and state and in the equal protection of all forms of religious faith. These advanced views did not meet with the approval of the Puritans of Massachusetts, and Roger Williams was ordered back to England. He escaped to the wilderness and passed the winter with the Narragansett Indians. He was an accomplished linguist and soon learned their language and acquired great influence over them. In the spring of 1636, Winthrop privately sent word to him that he was at liberty to settle at Narragansett Bay, as no one would molest him. He started a settlement and called it Providence.

This same year, 1636, a bright and capable woman named Anne Hutchinson came to Boston and gave lectures there. She soon had a large following, among them John Cotton and the governor, Sir Henry Vane. Her views were considered dangerous by the majority of the people and she was expelled from the colony. Going northward, some of her friends founded the towns of Exeter and Hampton. She herself bought the island of Aquidneck from the Indians for forty fathoms of white wampum, twenty hoes and ten coats. The island was soon called Rhode Island. Anne and her friends founded Portsmouth, while at the southern end of the island William Coddington began the town of Newport. Later she moved into the New Netherlands and was murdered by the Indians.

10. Sir Henry Vane, who had arrived in Boston shortly before the departure of Roger Williams, was one of the greatest of the Puritan statesmen. Like Williams he was a friend of toleration, and he also found Massachusetts an uncomfortable home. In 1636 he was only twenty-four years old, yet he was chosen governor for that year. In the spring of 1637 Winthrop was chosen governor and Vane returned



THE PURITAN

From the statue by Augustus Saint-Gaudens

MICROCOPY RESOLUTION TEST CHART

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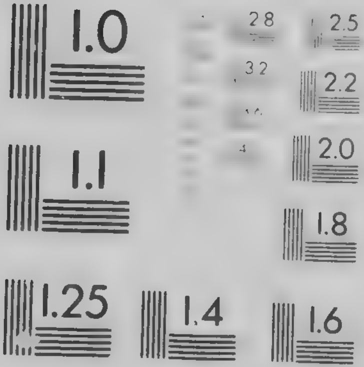

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to England. His father was close to King Charles, and Vane was able to aid the Puritans in getting and maintaining charters. He was for a long time member of Parliament and joint treasurer of the navy. He was arrested at the restoration of Charles II and executed on a charge of treason.

11. The eventful year of 1636 saw the beginning of Connecticut. The Dutch had sent a branch colony from New Amsterdam to Hartford. The younger John Winthrop, son of the founder of Boston, saw that the Connecticut River was important for the fur trade. In 1635 he built a fort at the mouth of the Connecticut River which shut off the Dutch from the harbor and made it impossible for them to hold Hartford. He named it Saybrook for two Puritan noblemen, the lords Say and Brooke.

12. This same year twenty vessels came from England to Massachusetts, bringing 3,000 colonists. There was plenty of room for them near Boston, but they did not approve of the Massachusetts plan of allowing none but church members to vote. Some members of the Massachusetts colony felt the same opposition to putting so much power into the hands of the church. In the towns of Dorchester, Newtown and Watertown this feeling was very strong. Thomas Hooker, the pastor of Newtown, thought that every colonist should help in legislation. Winthrop defended the restriction of suffrage, writing to Hooker, "the best part is always the least, and of that best part the wiser part is always the lesser." Hooker replied, "in matters which concern the common good, a general council, chosen by all, I conceive most suitable to rule and most safe for relief of the whole." As they could not agree, in the summer of 1636 the Newtown congregation, led by their pastor, and taking with them 160 head of cattle, made their way through the wilderness to Connecticut and established themselves at Hartford. The Dorchester and Watertown congregations soon followed Many of the newcomers, attracted by this freedom of suffrage, pushed their way on to Connecticut. The towns of Windsor and Wethersfield were founded, and before the next summer

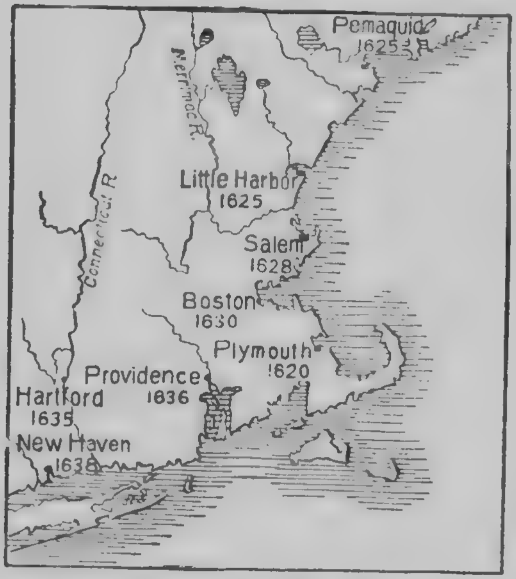
opened, more than 800 people were living in these three towns.

13. The treaty which the Pilgrims had made with Massasoit kept the Wampanoags quiet for many years. The Narragansetts were kept in order by the friendship of Roger Williams. But the Pequots, a powerful tribe at the west, resented the encroachments of the white men and resolved to drive them from the country. For several months the Pequots prowled around the Connecticut villages, murdering and kidnapping until the colonists could endure their outrages no longer. Connecticut gathered a force of ninety men under John Mason, and Massachusetts sent twenty men under the daring and eccentric John Underhill. With their Indian allies they attacked the stronghold of the Pequots, containing 700 Indians, and demolished it. Only five Indians escaped. The Pequots as a nation were destroyed, and the terror inspired by this slaughter kept other tribes in subjection for many years.

14. In 1638 the town of New Haven was founded by a company of wealthy London merchants who came to Boston with their families. Their pastor who accompanied them was John Davenport, a graduate of Oxford and vicar of a London parish. With Theophilus Eaton, a member of the Massachusetts Bay Colony, he planned this migration to New England. Finding some dissension at Boston they decided to found a settlement of their own. The merchants wanted a good harbor and found what they desired at New Haven. The next year a party from New Haven founded Milford, while another, fresh from London, settled at Guilford. In 1640 Stanford was added to the group, and in 1643 the four towns were united into the republic of New Haven. In the New Haven colony none but church members could vote. The power of the clergy reached the extreme, but the famous "Blue Laws" were a myth concocted by a Tory refugee, Dr. Peters, who wished to bring discredit upon his fellow New Englanders. In a book which he published in 1781 in London, he states that in New Haven "no woman shall kiss her child on the Sabbath ' and that "no one shall play on any instrument of

music except the drum, trumpet, or jewsharp." These statements were accepted as facts by many people and the Blue Laws of Connecticut were often quoted.

15. In 1643 the colonies of Massachusetts, Connecticut, New Haven and Plymouth combined for protection against the Indians and the Dutch. They called themselves "The United Colonies of New England." The affairs were managed by two representatives from each colony. Rhode Island was not allowed in the confederation because Roger Williams allowed too much freedom of belief. While this confederation was not entirely satisfactory, it lasted for forty years.



EARLY SETTLEMENTS NEAR BOSTON

16. When the Long Parliament met in 1640 the Puritan exodus came to an end. The population of the New England colonies was now about 26,000, the greater part of which had come over during the reign of Charles I. The Puritans in England were for many years occupied with affairs in their own country, and the colony in New England continued to multiply on its own soil for a century and a half, in remarkable seclusion from other communities. These colonists were selected men from the best English stock. One of their number said in 1688, "God sifted a whole nation, that he might send choice grain into the wilderness." In this independent, isolated life this sturdy people developed a type of

character that has been of great value to the world. It was not until after the Revolution that the Puritans began to push west. Most of the first settlers of New Brunswick and Nova Scotia, known as United Empire Loyalists, came of this stock.

17. The rank and file as well as the leaders of New England history were people of strong religious convictions and of fixed determination to assert their religious rights. They were stern and uncompromising, not very kindly disposed toward those, even of their own number, who differed from them in opinion. They were strongly democratic in their way of thinking, although some of their leaders, like Winthrop, believed the more intelligent and educated few should rule. They established the town meeting for controlling local affairs and for choosing representatives to the General Court or legislature. The average man was practical, industrious, well versed in the Scripture and qualified to vote and discuss matters in the town meeting. A comparison of the New England folk with those of other colonies which you will doubtless study later will be fruitful. The reasons for which the founders of the different colonies left their homes of course determined in large measure the character of the people who were originally attracted to them.

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47. Type Study on the Union Jack

Suggestions as to Method

(*a*) A number of historical facts may be associated with the evolution of the flag.

(*b*) In teaching respect for the symbolism of the flag, the sense of nationality and patriotism are inculcated.

(*c*) The books referred to in the list give excellent colored pictures of the various flags used in English history, and also those of other nations in comparison.

(*d*) Many interesting stories from the battlefield and from the lives of great soldiers can be used in connection with the study of the flag.

(*e*) The ceremonial uses of the flag can be put in practice in some of the school exercises and celebrations.

(*f*) Children should be taught to despise the desecration of the flag to commercial uses and to any kind of unworthy treatment or use.

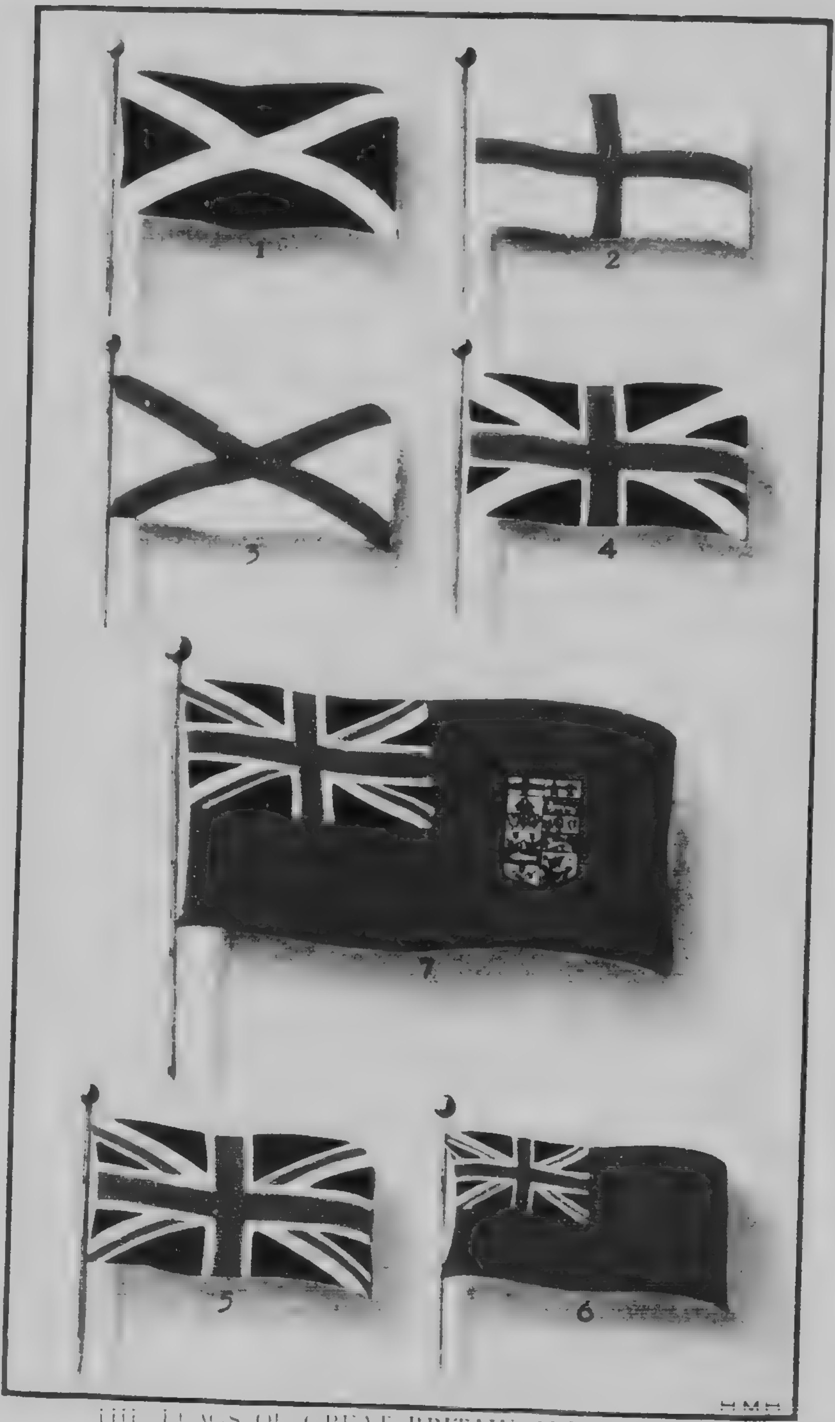
Outline of Topics

1. Why we have a flag and owe it respect.
2. Origin of the flag.
3. Changes in the flag and its final form.
4. Ceremonial uses of the flag.
5. Directions for making a Union Jack.
6. The ensigns.
7. Royal standard.
8. Flag song.
9. Comparison with flags of France, Germany and other nations.

TYPE STUDY ON THE UNION JACK

1. Senator Summer of Massachusetts, speaking of his own flag, said:—"It is a piece of bunting lifted in the air, but it speaks sublimity, and every part has a voice."

There is no flag of which this is more true than it is of the Union Jack. The Union Jack has come to be a much cherished symbol of our national life. It has not always been so regarded, and it is only within the last two hundred years that it has acquired universal respect and honor and has become recognized at home and abroad as the symbol of British dominion.



THE FLAGS OF GREAT BRITAIN AND CANADA

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Every country takes a pride in its flag as a symbol of whatever greatness or power it represents among its people. But the English people look upon this flag as the symbol of progress and liberty more than that of any other nation. On the ocean the flag floats at the masthead of British vessels wherever they sail, giving notice to all peoples of our Empire. On all great national holidays we put the flag forward and carry it at the head of marching men and children and we decorate our houses with it, showing that something very important leads us to this devotion to the flag. We can afford to look more fully into the history of our national banner and at some of the reasons why it waves over every Briton as the emblem of his mother country.

2. The Union Jack is the "cross" flag, being composed of the three crosses which represent the three great nations, England, Scotland, and Ireland, which with Wales form the United Kingdom of Great Britain and Ireland. The crosses in the flag represent the historic developments that led to the union of the different parts of the United Kingdom, and the Union Jack itself is the flag that led the way over the world for the advance of civilization.

The English Jack, or St. George's cross, is a rectangular red cross on a white ground; the Scotch Jack, or St. Andrew's cross, is a diagonal white cross on a blue ground; the Irish Jack, or St. Patrick's cross, is a diagonal red cross on a white ground. (See colored plate opposite.) The blue of the Union Jack comes from the Scotch Jack, the red comes from the Jacks of England and Ireland, and the white belongs to all three countries. The flag of Englishmen is the banner of St. George, a red cross on a white field. There are legends relating how this saint rendered great aid and service to King Richard the Lion-Hearted, who placed himself and the English army under the saint's protection, and during the twelfth century St. George became the patron saint of England. The first Union Jack was made in 1606, three years after King James of Scotland succeeded to the throne of England. Thus, as King of England as well as of Scotland, he issued the following proclamation, because difficulties had arisen on sea between some of his subjects in South Britain (England) and some of those in North Britain (Scotland)

"A proclamation declaring what Flagges South and North Britaines shall beare at Sea.

"By The King:

> "Whereas, some difference hath arisen between our subjects of South and North Britaine travelling by Seas, about the bearing of their Flagges: For the avoiding of all such contentions hereafter wee have, with the advice of Our Councell, ordered: That from henceforth all our subjects of this Isle and Kingdome of Great Britaine, and all our members thereof, shall beare in their *maine toppe* the Red Crosse, commonly called St. George's Crosse, and the White Crosse, commonly called St. Andrew's Crosse, *joyned together according to the forme made by our heralds*, and sent by us to our Admerell to be published to our subjects; and in their *fore-toppe* our Subjects of South Britaine shall weare the Red Crosse onely as they were wont, and our Subjects of North Britaine in their *fore-toppe* the White Crosse onely as they were accustomed."

3. This Union Jack was made by combining the two jacks of England and Scotland, and was nearly the same as the one adopted by Queen Anne in 1707. The difference between the jacks of James I and Queen Anne was that the white border round the St. George's Cross was made wider in Queen Anne's jack, to give the English jack a little more prominence.

It should be noted that while the King of the two countries had adopted a Union Jack, each country retained its own jack on its vessels. The Union Jack floated from the "maine toppe" of ships of both countries, and the English and Scotch jacks floated from the "fore-toppe" of the vessels of the respective countries.

In the year 1707, when in the reign of Queen Anne the parliaments of England and Scotland were united, the "two-cross flag" made by uniting the jacks of England and Scotland, was adopted as the national flag, by Act of Parliament.

For nearly a hundred years the "two-cross Jack" floated throughout the British Empire as the emblem of England's power. It was during this century that England extended her empire. This two-cross Union Jack was planted in India by Clive after his great victories. Wolfe's victory put it on the citadel at Quebec. Nelson won his victories under it, and in South Africa and Australia it was the first British flag to float

Ireland had long been ruled by the English King, and Irishmen had gallantly helped to win British victories in all parts of the world, but there was no part of the Union Jack to stir the hearts of Irishmen. In 1801, under George III, the Irish Parliament united with that of England, and then the Irish diagonal red cross was for the first time united with the crosses of England and Scotland, to form the Union Jack which is still the national flag of Great Britain and her colonies.

As the white Scotch cross of St. Andrew and the red Irish cross of St. Patrick are both diagonal crosses, it was clear that some special design was necessary if both crosses were to show on the Union Jack. The Scotch representatives insisted that on the half of the Jack next to the flagpole the band of Scotch white above the Irish cross should be as wide as the band of Irish red and white combined, or in other words, that the Scotch cross should be above the Irish cross next the flagpole. This was accepted by the Irish on condition that on the other half of the Union Jack the Irish cross both red and white should be above the Scotch cross. In no properly constructed Union Jack does the Irish cross run straight from corner to corner. The Irish cross should be below the Scotch on the half next the flagpole (or the left side) and above it on the other side. All Canadians should be trained to fly their Union Jacks properly, and to hang them correctly when they are used for inside decoration.

4. The Union Jack is the proper flag to fly over the Parliament and Legislative Buildings. It is also the proper flag for schools throughout the Empire. Private citizens in

any part of the Empire have the right to use the Union Jack as their own individual flag on their home, in accordance with a decision given by the Secretary of State in the British Parliament in 1908.

The Union Jack is the universal national flag in all parts of the British Empire. It should fly over every school in Canada on the great epoch-making days in the history of Canada. In some places it is the custom to have the flag flying over the schools every school day throughout the year. It is a less expensive and much more impressive plan to have the flag raised with appropriate ceremonies before the opening of school on historic days, when all the pupils are assembled in the school year. The teacher, or some man or woman of enthusiasm and ability should briefly explain the reason for raising the flag on that day, and at a signal pupils chosen for the honour should raise the flag to the top of the flagpole, while the whole school should with uncovered heads sing an appropriate song ending with cheers for the flag. This they will do with enthusiasm if they have been taught that our Union Jack is the flag that most truly represents the growth of justice, freedom, and unity throughout the world.

5. Once a year, best of all times during the week preceding Empire Day, May 23rd, the pupils in every school should be trained to construct the Union Jack, with colored papers, paints or crayons.

The Union Jack may be properly constructed as a square flag, or as an oblong. An oblong Union Jack was originally twice as long as it was wide. A more beautiful form is to have the width two-thirds the length. For teaching its construction to pupils it is better first to make the square Jack. The most complete way to show the construction of the Union Jack and at the same time illustrate the history of its development is to give each pupil a piece of paper or a thin cardboard from two to three inches wide and three times as long as it is wide. Let them measure it exactly into three squares and fold in the end squares on the central square. Open out the squares, and teach the pupils to make St.

George's cross on the central square, St. Andrew's cross on the left square, and St. Patrick's cross on the right square. Explain the formation of the "two-cross Jack" representing England and Scotland, and teach the pupils to make it on the back of the left square. Then on the back of the right square teach the pupils to make the complete Union Jack with the Irish cross united with the other two.

The correct widths of the various crosses in a properly constructed Union Jack are: red cross of St. George, one fifth the width of the flag; white border of St. George, one third of the red of St. George; red cross of St. Patrick, one third of red of St. George; white border of St. Patrick, one sixth of red of St. George; broad white of St. Andrew, one half of red of St. George. It should always be remembered that the broad white of St. Andrew is above the red of St. Patrick on the half next the flag pole, and below it on the other half of the flag.

6. An ensign is a flag with an oblong Union Jack in the upper left hand corner and a field of red, or white, or blue.

The red ensign is the proper national flag for all British merchant ships.

The white ensign, which has St. George's cross in addition to the Union Jack, is used only by the ships of the Royal Navy or by yacht clubs to which special license has been granted.

The blue ensign is used by ships of the Royal Navy Reserve, or by merchant vessels commanded by officers of the reserve, or by yacht clubs with a special license.

In an ensign the oblong Union Jack should be one half as long as the flag.

The Canadian ensign is the red ensign with the arms of Canada on the field or red portion of the flag. Strictly speaking, the Canadian arms on the flag should be formed by combining the arms of the four provinces that united to form the Dominion in 1867—Ontario, Quebec, New Brunswick, and Nova Scotia. It is permissible to use the arms of each province now in the Dominion in forming the crest of the Dominion.

7. The royal standard of England is also a union flag, representing England, Scotland and Ireland. It is divided into four quarters, the first and fourth representing England, the second and third, Scotland and Ireland. This is a royal banner, symbolic of the sovereignty of the royal house. The first and fourth quarters each have three lions in gold on a red field; the second quarter a single lion, in a heavy frame, in red on a gold field; the third quarter a golden winged harp.

In each province the pupils should be taught how to make their own crest, and the crest of the Dominion.

8. THE UNION JACK.

"It's only a small bit of bunting,
It's only an old colored rag,
Yet thousands have died for its honour
And shed their best blood for the flag.

"It's charged with the cross of St. Andrew,
Which, of old, Scotland's heroes has led;
It carries the cross of St. Patrick,
For which Ireland's bravest have bled.

"Joined with these is our old English ensign,
St. George's red cross on white field,
Round which, from King Richard to Wolseley,
Britons conquer or die, but ne'er yield.

"It flutters triumphant o'er ocean,
As free as the winds and the waves;
And bondsmen from shackles unloosened
'Neath its shadow no longer are slaves.

"It floats over Cypress and Malta,
O'er Canada, the Indies, Hong Kong;
And Britons, where'er their flag's flying,
Claim the rights which to Britons belong.

"We hoist it to show our devotion
To our King, to our country, and laws;
It's the outward and visible emblem
Of advancement and Liberty's cause.

"You may say it's an old bit of bunting,
    You may call it an old colored rag;
But Freedom has made it majestic,
    And time has ennobled the flag."

9. The flag of France begins its history back in the seventeenth century. The oriflamme of Charlemagne was given him by the pope in 800. At the end of the sixteenth century the fleur-de-lis was substituted for the oriflamme. The fleur-de-lis remained the *emblem* on the French national flag until the French Revolution.

After many changes the French flag today is the tricolour, blue, white, red, three vertical bars of equal width. This flag was adopted in 1794 by the French revolutionary convention, and afterward by Napoleon I. Under this flag Napoleon gained his victories, and on the flag of each regiment he had inscribed the names of the battles in which it was victorious. He inspired a remarkable enthusiasm for the flag. When the Third Republic was established in 1871, the tricolour was again adopted, and it is now the national flag of France.

The German flag most familiar is that of the merchant marine, with its three horizontal bars of black, white and red. This flag was adopted in 1867 when the North German Confederation was established. In its colours are combined the red and white of the Hanseatic League and the black and white of the house of Hohenzollern.

The Italian flag was adopted in 1805, when Napoleon formed Italy into a single kingdom. Like the French flag, it was tricoloured, a green bar being substituted for the blue on the French flag. When Victor Emmanuel was proclaimed king of united Italy in 1860 he retained the tricolour, but placed in the center of the flag the arms of Savoy.

The national flag of the United States is composed of even red and six white horizontal stripes, with a blue field ontaining forty-eight white stars. The stripes represent the thirteen original colonies which united to form that country, while the stars indicate the present number of states.

REFERENCES ON THE FLAG. *History of the Union Jack.* Barlow Cumberland

Our Flags: Their Origin, Use and Traditions. Rear-Admiral S Eardley-Wilmot.

Flags of the World: Their History, Blazonry and Associations. Edward Hulme.

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48. Type Study on the Struggle Between the English and the French in North America.

Suggestions as to Method

(*a*) A large map of North America will be needed to give a fair idea of the extent of this struggle.

(*b*) The relation of the wars in America to conditions in Europe should be emphasized. A good example of this relation was the sacrifice of Louisburg for territory in India by the terms of the Treaty of Aix-la-Chapelle

(*c*) If time permits, the physical character of the country should receive discussion.

(*d*) Discuss the difference in the habits and manner of living of the English and the French in North America, and let the children see the influence these differences exerted

(*e*) The details of wars and battles are likely to be confused unless the teacher gives a clear summary of the whole struggle. Such a summary need not include names and dates, but it will serve as a framework.

Outline of Topics

1. Early settlements.
2. First conflicts between French and English.
3. From the beginning of King William's War to the Peace of Utrecht.
4. The War of the Austrian Succession. Capture of Louisburg. Exile of the Acadians.
5. The struggle in the Ohio Valley.
6. The "Seven Years' War." Capture of Niagara, Fort Ticonderoga and Quebec.

THE STRUGGLE BETWEEN THE ENGLISH AND THE FRENCH IN NORTH AMERICA

1. The French led by Champlain began the settlement of North America in what is now Canada. Gradually following

the gateway of the St. Lawrence River and the Great Lakes they penetrated to the centre of the continent. They explored the Mississippi River, and finally, nearly one hundred and fifty years after Champlain founded Quebec, they began to establish themselves behind the English colonies along the Atlantic coast, in the Ohio valley.

The English settled chiefly in two parts of North America —New England and Virginia. New England was settled by the Puritans, a sturdy stock of religious men, lovers of liberty, who had sacrificed everything but life for the sake of their principles. Virginia was settled by a more aristocratic class, most of whom were men of high ideals, of adventurous spirit, and of chivalrous principles. In addition to these two main English colonies in America, smaller settlements were gradually formed along Nova Scotia and Newfoundland, as the English claimed the right to settle these districts because of the discoveries of John and Sebastian Cabot. Between New England and Virginia the Dutch had settled in New York, especially in what they named New Netherlands, from the mouth of the Hudson River northward and westward. In 1664 the English won the Dutch territory in North America, and named the city at the mouth of the Hudson, New York. The Dutch power in America was overthrown about one hundred years before the French had to surrender the northern half of the continent to the English.

The country, occupied by the French, was originally in the hands of three Indian tribes: the Iroquois in New York State, and the Algonquins and Hurons, who occupied a large part of the country now included in the Provinces of Quebec and Ontario. Champlain made a serious mistake when he quarreled with the Iroquois, as they became the allies of the English. The Algonquins and the Hurons were usually friendly to the French, especially after the work of the Jesuit Fathers among them.

At first the French settlers were more adventurous and more aggressive than the English. They made voyages of discovery, built forts, and lived chiefly on the profits of the fur trade. The English settled on the land, cleared it, and established villages and towns. The English colonies increased in population more rapidly than the French colonies on this account.

2. There were many wars between the French and English colonists, covering a period of about a hundred and thirty years before the final overthrow of French power on the Heights of Abraham at Quebec in 1759. These wars were nearly always a part of larger struggles between France and England on the other side of the Atlantic.

In 1628 for the first time England decided to make an effort to secure possession of the French colonies in North America. England was at war with France, and she carried the war into America. She sent a fleet under Admiral Kirke to take Quebec. Kirke's fleet sailed up the broad St. Lawrence. His ships were the first British ships to navigate the wonderful river. He destroyed a French fleet that he met at the mouth of the Saguenay, but returned to England without driving Champlain from his fortress at Quebec. He returned next year, however, and compelled Champlain to surrender. From 1629 to 1632 the English had possession of New France. In 1632 by the terms of the treaty of St. Germain-en-Laye, her former possessions were returned to France. During the next sixty years there were many quarrels between the Scotch colony in Nova Scotia and the Acadians, as the French in that district called themselves, and between the English in New England and in New York and the French to the north of them.

3. When King William's war with France began in 1689 the rival colonists in America took up the war in downright earnest. The French at that time had for Governor of New France, Frontenac, a man of splendid ability and a great soldier. He decided to drive out the English both from Hudson's Bay Territory and from New York. In the north he was successful, but in New York he failed although he was at first successful in his attacks on the Iroquois Indians who were friendly to the English. For nine years the war con-

tinued. Neither France nor England could send much assistance to their colonies in America. The French in America had two great and intrepid soldiers as leaders—Frontenac and le Moyne Iberville. The English had no great soldier leaders, so that on the whole the French more than held their own during these nine years. In 1697 the Treaty of Ryswick put an end to King William's War, and by the terms of this treaty matters in the American colonies were left as they were before the war. King William had made the power of England felt in Europe and he was satisfied.

COUNT DE FRONTENAC

Though the war was settled in Europe, the colonists in America continued their rivalry. The French aimed to drive the English out altogether, and the English planned to keep the French within prescribed limits—north of the Great Lakes if possible, at any rate north of the Ohio valley. War between England and France broke out again five years after the Treaty of Ryswick. The question of the Spanish Succession ranged France and Spain against England, Holland and Austria. In Europe the British and their allies won splendid victories at Blenheim, Oudenarde, Ramillies, and Malplaquet, and this fact enabled England at the close of the war in 1707 to demand and receive from the French Newfoundland and Acadie. The French retained Cape Breton (Isle Royal) and Prince Edward Island (St. John).

The English had now a better standing in America, but the French colonial leaders were determined to continue to struggle for supremacy with even greater energy than ever. They constructed the greatest fort yet established in America at Louisbourg, on the Island of Cape Breton, another at Niagara, and a third at the head of Lake Champlain, afterwards Crown Point. For thirty years after the Peace of Utrecht, 1712, the colonies in America proceeded with their plans to strengthen themselves without any real fighting. In the meantime the stream of British emigration was much larger than that into New France.

4. In 1742 came the War of the Austrian Succession. Again England and France were at war, and the American colonies soon renewed the old struggle. The French Governor of Louisbourg sent an army to drive the British out of Acadie. He attacked Annapolis, formerly under the French named Port Royal, but was finally compelled to retire.

The Governor of Massachusetts then organized a force of four thousand men, mainly merchants and farmers, under the command of William Pepperell, a man of great energy, who was a born leader of men, although he was without military training or experience. Pepperell determined to strike back at Louisbourg, which was so strong that it had been said—"An army of women could successfully defend it from attack." Pepperell lost no time. He soon landed on Cape Breton and while four English ships attacked the fort from the sea, he and his four thousand volunteers attacked it from the land. The French Governor was compelled to surrender, and the people of New England looked into the future with pride and hope. Great was their dismay when at the close of the war, England by the Treaty of Aix la Chapelle traded Louisbourg for territory in India.

The fact that peace was proclaimed by the mother countries, France and England, did not restrain the colonists. Each party decided to make itself more secure. The English founded Halifax, and continued to bring over increasingly large numbers of emigrants from Scotland and England. They also found that the Acadian French were intriguing with the French leaders at Quebec. So they expelled them from their homes, in order to make sure once for all that Nova Scotia would be a British province.

5. Meanwhile two French Governors, De la Gallisoniere and Du Quesne determined to secure the Ohio valley for the French. Due Quesne strengthened the old forts in the valley and built several new ones, and tried to secure the friendship of the Indians of the district

The English colonists sent George Washington as an envoy to secure an agreement in regard to the rights of trading in the Ohio valley. He failed to secure a satisfactory agreement. The Ohio Company was then formed for the purpose of trading in the Ohio valley in defiance of French authority. This Company built a fort at the junction of the Monongahela and Alleghany Rivers. The French promptly sent an expedition which destroyed the English fort and erected a stronger fort on the same site, which they named Fort Du Quesne, after the Governor of New France.

The Governor of Virginia sent Washington again, now a lieutenant-colonel in command of a small army, to drive out the French. Washington's whole army was surrounded by a superior force, however, and he was forced to surrender. His men were allowed to retire, and return to their homes. This left the French masters of the valley of the Ohio.

In 1754 the English sent out General Braddock, with two regiments to help the colonists. The French sent out Baron Dieskau, with an army to help the French. Braddock led an army of two thousand men to the Ohio valley to attack Fort Du Quesne. He had had no experience in warfare in the woods. He refused to take the advice of Colonel Washington, who was one of his officers, and led his army into a deep ravine on the side of the steep bank of the Monongahela, near Fort Du Quesne. There, two hundred Frenchmen with a number of Indians surprised him. Braddock himself was killed, and Washington, after having two horses shot under him, escaped with less than half the army.

Baron Dieskau led a large army up the Lake Champlain valley to attack the English in New York. Sir William Johnson, who had lived for many years in New York State, and who was the idol of the Iroquois Indians, met him at

Lake George. Dieskau, like Braddock, scorned advice. He was wounded and captured by Johnson, and his army utterly routed.

A BRITISH GRENADIER

6. The "Seven Years' War" between England and France began in 1755. At that time the French in North America were in the ascendant in the north, and in the Ohio valley, while the English had been successful in Nova Scotia, and in the centre. The English colonies in New England, New York, and Virginia, were also stronger than at any previous time. In the "Seven Years' War" England was opposed by France, Russia, and Austria, and helped by the Prussians. In the beginning of the war the hopes of the English colonists were not very bright. The French General Montcalm was vastly superior to the men sent to command the English. He was quick to plan, and swift to execute his plans. He attacked the English by way of Lake Champlain and defeated them while the English commanders were lying idle in the east.

GENERAL JAMES WOLFE

But a new head came to power in the British government. William Pitt, the Great Commoner, was the man England needed. He knew that success depended on good leadership, and he was a good judge of men. He sent out three true leaders in 1758—Lord Amherst, Major-General Wolfe, and Admiral Boscawen, with an army and fleet. Their instructions were to capture Louisbourg and Quebec. They began at once to attack Louisbourg, which was defended by three thousand soldiers, and which was believed by the French to be impregnable. Both from sea and land a persistent and vigorous siege was conducted, until the strongest fortress then in America surrendered, and the British controlled the Gulf of St. Lawrence. The surrender of Louisbourg gave both Cape Breton and Prince Edward Island to the British. This time they were not given back.

The year 1758 was not all success for the British however The brilliant Montcalm defeated General Abercrombie, when he tried to win his way through the French lines at Ticonderoga in an attempt to reach Montreal by the Lake Champlain route. Colonel Bradstreet did better by crossing to Fort Frontenac (Kingston), which he surprised and captured with rich stores and several ships. Better still, toward the end of the year, General Forbes drove the French out of Fort Du Quesne, and named it Fort Pitt, in honour of the British Prime Minister. This fort gave the name to the present city of Pittsburg.

MARQUIS DE MONTCALM

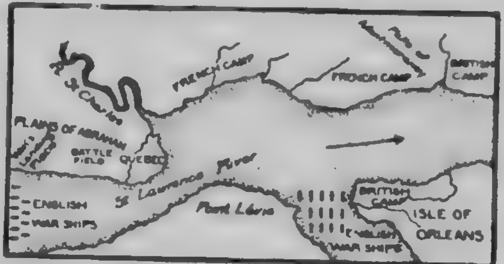
In the eventful year 1759, General Amherst planned three expeditions—one in the east against Quebec, one in the west against Fort Niagara, and one in the centre. Wolfe led the army against Quebec. General Prideaux and Sir William Johnson led the attack on Niagara, and General Amherst himself commanded the army of the centre. Niagara was soon captured, and Amherst forced the French out of Fort Ticonderoga, but then spent the rest of the year building a fleet to destroy the French fleet on Lake Champlain.

The great struggle took place at Quebec, which was defended by Montcalm himself, with an army of fifteen thousand men. Wolfe had an army of nine thousand well trained men, and he was assisted by a strong fleet. For months the siege proceeded. Wolfe hoped that he might by a combined attack on land and from the river force Montcalm to come out from the city and risk a battle in the open, but Montcalm was too good a general to do this. The season was passing away rapidly. Wolfe was ill, and food was growing scarce.

THE CITADEL OF QUEBEC IN 1759

Finally Wolfe planned one of the boldest movements ever executed by any general. While the fleet fiercely bombarded the city to engage the attention of the French he took his army during the night in boats up the river, past the city to a spot where a path led up the precipitous cliff to the Heights of Abraham behind the city. He succeeded in the almost impossible task, and in the mist of the morning of September 13th, he arranged his troops to meet Montcalm. The startled

French leader promptly accepted Wolfe's challenge, but he was defeated. Wolfe died on the field a few minutes after he heard the cheering of his men for the victory he had won. Montcalm died next morning from a wound received in defending his beloved city.



PLAN OF THE FRENCH AND ENGLISH POSITIONS BEFORE THE CAPTURE OF QUEBEC

The victory at Quebec practically ended the struggles of one hundred and thirty years for the possession of North America. The Union Jack was planted on the citadel, where it still floats.

General De Levis, who succeeded Montcalm, held out in Montreal till 1760, when he was surrounded by superior numbers and forced to capitulate. The last French Governor, De Vaudreuil, then surrendered the whole of New France to the British.

In 1763 the Treaty of Paris formally gave the country to England, and the authority of France was at an end.

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49. Type Study on the War of 1812.

Suggestions as to Method

(*a*) A large map of North America, or at least of the eastern half, should be used to help the children locate the important places.

(*b*) The supposed objects of the war should be considered.

(*c*) Pictures of Tecumseh, Laura Secord and other patriots, as well as battlefields, are interesting additions to the material for study

(*d* If the school is in the vicinity of a battlefield it will be a great joy and benefit to the pupils if they can visit the scene under the guidance of the teacher.

(*e*) The story of Laura Secord makes a valuable lesson in patriotism.

(*f*) Try to show clearly the causes of the war and its indecisive character.

Outline of Topics

1. Causes of the war.
2. Attitude of Canadians towards the war.
3. American plan of campaign in 1812.
4. Campaigns of 1813.
5. The last year of the war.
6. Summary of results.

THE WAR OF 1812

1. The story of this war should be told to Canadian boys and girls everywhere to give them faith in their country and in themselves.

The Canadian people had nothing to do with bringing on the war. It was caused by European conditions over which Canadians had no control. The great Napoleon had become practically master of Europe. England was the one country that had not been humiliated by the master soldier. In order to try to ruin British commerce, he issued a decree placing British ports under blockade, and prohibiting British ships from entering European ports. The British Government in return passed an Order-in-Council demanding that the vessels of neutral powers should not trade with European powers without first calling at British ports and paying duty. To many this course appeared arbitrary. The Government of the United States especially objected to the action of the British, and a strong feeling of resentment was naturally felt against England. This feeling was intensified by another act of the British in demanding the right to search United States ships for sailors who had deserted from the British fleet.

After a long discussion, England withdrew the obnoxious Order-in-Council, and apologized for searching United States ships to find seamen who had deserted. This should have restored harmony between the two countries, and it undoubtedly would have done so but for the fact that a large body of the people in the United States were in sympathy with Napoleon. Two reasons may account for this: the French had assisted the United States against England in the "War of the Revolution," and the anti-British feeling resulting from that war still existed in many places.

It is worth noting that in New England, where the rebellion against England in the time of the "Revolutionary War" first reached a crisis, the people in 1812, thirty-five years later, strongly opposed going to war with England. However, the dominant political party insisted on war with England, although the long correspondence between the two countries had ended in a way that should nave been satisfactory to the people of the United States.

The only reasonable excuse for the war was the desire of many politicians in the United States to secure control of the whole continent of North America by ending British authority in Canada. The time for doing this seemed to be opportune England was at war with Napoleon. The population of Canada was only four hundred thousand, while that of the United States was about eight millions. Among the four hundred thousand Canadians there were some who were disaffected, and the United States Government believed that few, if any, would really take up arms to resist invasion and retain connection with the motherland across the Atlantic. The Secretary of War in Washington was so confident of the wish of Canadians to be free from English rule that he said "The expulsion of the English is a mere matter of marching." Against the advice of many of the best people of the United States war was declared against England in June, 1812.

2. The calculations of tne United States statesmen were soon proved to be wrong. Canadian loyalty was aroused, and the scattered settlers in spite of the enormous difficulties they

had to face, organized into militia companies and determined to fight strenuously against the invaders of their country. At this time we can hardly conceive the disadvantages of the Canadian settlers. They were scattered over a country more than a thousand miles long from east to west. Their farms were only partially cleared. Their crops were not harvested. But their hearts were full of loyalty to the British Empire, and they armed themselves and marched to the front to meet and drive back the men who came to invade their country.

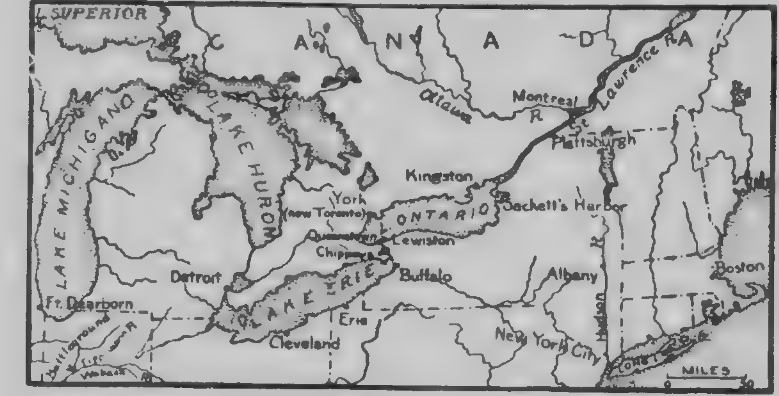
In Lower Canada as well as in Upper Canada and in the colonies on the Atlantic, the spirit of loyalty to England prevailed. The French colonists refused to join the United States, and remained true to the government under which they had lived harmoniously for sixty years. In Upper Canada the Canadian leader was General Sir Isaac Brock. He had been in Canada for ten years, had been made Commander-in-chief, and had won the confidence of the people.

SIR ISAAC BROCK

3. The United States planned to attack Canada at three points. General Dearborn was to advance from Albany by way of Lake Champlain to Montreal; General Van Renssellaer was to cross into the Niagara peninsula: and General Hull was to enter Upper Canada by the west at Detroit; Acadia was not included in the plan because the people of New England were opposed to the war.

The Canadians were immediately successful in the west. Fort Michilimackinac was soon captured by a small army of the British, and this led the Indians of the district to unite with the Canadians.

General Hull crossed into Canada at Detroit and offered "peace, liberty, and security" to those who would give allegiance to the United States. Finding that the Canadians would not accept his offer, he retired to Detroit. General Brock then hurried to carry the war into the United States by laying siege to Detroit. General Hull quickly surrendered to General Brock. The United States gave up twenty-five hundred men and thirty-three cannon. This victory gave the British control of the west, and left Brock free to devote himself to the defence of the Niagara district. Brock was knighted by the king for his victory at Detroit.



WHERE THE WAR WAS WAGED

Two months after the surrender of General Hull at Detroit, a part of Van Renssellaer's army crossed from Lewiston to Queenston during the night, and without opposition took possession of Queenston Heights, a commanding position overlooking the whole country northward to Lake Ontario. General Brock was at Niagara seven miles from Queenston with a small force. He hurried to Queenston and gathering his men he began to climb the precipice in the face of the enemy's fire. He was shot at the foot of the Heights, and died urging the York Volunteers to "push on."

General Sheaffe, who succeeded Brock in the command, wisely took his men along the road to the west of the Heights, and succeeded in getting ahead of the invaders, and in preventing their advance. He thus had them at his mercy. Cautiously advancing towards the River Niagara, and extending his line, he proceeded till he came near the United States army. Then at a signal his men began a vigorous fire, and his Indians rushed through the woods giving their wild war whoop. Most of the United States soldiers surrendered. A few in desperation jumped over the steep cliff and hung for months in the trees in which they were caught

The Canadian people were filled with pride at the success of the untrained volunteers at Queenston Heights, and although the United States won some successes in small sea fights, the end of 1812 left the United States surprised and humiliated while Canada was triumphant and determined.

4. The United States began the campaigns of 1813 with larger armies, but little was accomplished during the year. General Dearborn had thirteen thousand men at Plattsburg, with two thousand at Sackett's Harbor, and five thousand on Lake Champlain. In all he had nearly twenty thousand men under his direction. He failed however to accomplish anything, although the Canadian forces to defend Montreal and the St. Lawrence River from Queenston to Montreal contained less than five thousand men. As in the previous year the close of the campaign in the north left the Canadian star in the ascendant. At Ogdensburg, Chrysler's Farm, and Chateauguay, the Canadians had defeated much larger armies of United States troops with comparatively small loss.

The United States fleet on Lake Ontario burned part of York (Toronto), and forced the Canadians to evacuate Fort George near the mouth of the Niagara River. A United States force followed the British towards Hamilton, but they were surprised and defeated at Stoney Creek, near Hamilton. Another force planned to surprise Colonel Fitzgibbon at Beaver Dams, but he was warned of its coming by the Canadian heroine, Laura Secord, and he captured the whole of the United States soldiers sent to surprise him.

In the west the army of invasion was more successful, although in January General Proctor won a victory at

Frenchtown, below Detroit, and captured five hundred United States soldiers. The turning point came after a naval battle on Lake Erie, near Cleveland, in which Commodore Perry signally defeated the Canadian fleet. This defeat made it impossible for the Canadians to remain longer in Detroit. Proctor with eight hundred Canadians and five hundred Indians under Tecumseh, a brave and wise chieftain, started eastward along the Thames River, followed by General Harrison with three thousand five hundred men. Proctor gave battle at a point near Moraviantown, and was defeated. Although Proctor retired, Tecumseh fought on till he was killed. General Harrison did not follow up his victory, however, but retired to Detroit.

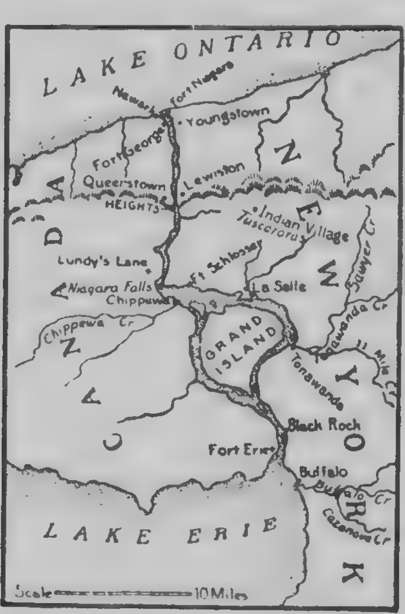
TECUMSEH

An incident in the war of 1813 was a fight between the English ship *Shannon*, and the United States ship *Chesapeake*. The English Commander, Captain Broke, issued a formal challenge to Captain Lawrence of the Chesapeake to come out to sea for a fair fight in the open. The challenge was gallantly accepted. Many of the people of Boston went out to witness the fight. Captain Lawrence was wounded early and died, calling to his officers: "Don't give up the ship." The Shannon soon captured the Chesapeake, however, and sailed away with her prize.

5. The campaign of 1814 began with an advance towards Montreal, along the old Lake Champlain lines, where so many generals of the English, the French, and the United States, had previously tried for success only to meet defeat. General

Wilkinson, with five thousand men, had crossed the Canadian border, and seemed to be in a position to make a quick rush to Montreal, when he was stopped and defeated by a garrison of five hundred Canadians entrenched in La Colle Mill. He retreated and did not return. Canadians under Sir Gordon Drummond captured Oswego.

The real fighting of 1814 was done in the Niagara district. The Canadians were first defeated at Chippewa above Niagara Falls. They retreated to Lundy's Lane close to the Falls, and there was fought one of the fiercest battles in history on July 25th. For six hours five thousand United States troops fought almost hand to hand against a Canadian army of about one-half their number. Within a few yards of each other they stood till ten o'clock fighting in the moonlight, but the Canadians would not retreat. The United States General then retired leaving the Canadians in possession of the hard fought field. He retreated next day to Fort Erie.



THE BATTLEFIELDS ON THE NIAGARA PENINSULA

The last battle of the war was fought at Plattsburg on Lake Champlain. A battle was fought below New Orleans on January 8, 1815, but peace had already been declared before it was fought, though the news reached New Orleans too late. The ending of the war with Napoleon enabled the British government to send a fine army of fifteen thousand men to Canada. General Prevost determined to lead this army down the Lake Champlain Valley and attack the United

States army that threatened Montreal. He proved to be incompetent. The fleet accompanying him was defeated at Plattsburg, and he retreated without even making an effort to attack the army opposed to him, although it was but one-fourth the size of his own.

One regrettable event of the war was the burning of Washington by a British fleet. The only justification for the course adopted was that the United States had burned the parliament buildings in Toronto in 1812

6. "The War of 1812" should not have been fought. The reasons given by the United States for beginning the war were not even mentioned in the record of the Treaty of Ghent which brought the war to a close. The real reason in the minds of the war party in the United States was that they thought the Canadians could not defend themselves, and that a considerable number of the Canadians would gladly be [illegible] free from the control of England. They were wrong in [illegible] their impressions, and they failed utterly in their plans. Not a foot of Canadian territory was won by the war, and the foreign trade of the United States was very seriously impaired.

The Canadian people, though only a scattered handful, proved themselves to be loyal and self-sacrificing. For three years they endured great hardships to defend their country, and their success gave them stronger faith in themselves, and deeper attachment to England. Canadians for all time should be proud of the valor of their ancestors of 1812, but all true Canadians rejoice in the friendship that has so long existed between the United States and Canada, and they will continue to work with the view of strengthening the ties between Canadians and their kinsmen in the United States.

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50. Type Study on Laura Secord.

Suggestions as to Method

(*a*) Use maps and pictures as much as possible

(*b*) Let the pupils see that Mrs. Secord's action was of considerable importance from a military point of view

(*c*) The life of Laura Secord gives an excellent opportunity to describe pioneer life in Canada. Pictures of canoes and modes of travel, forts and blockhouses, Indian scenes and pictures, are useful

(*d*) Lay stress on patriotism and show that every Canadian, though he or she can not be a Laura Secord, may serve this country in other ways

(*e*) Collect interesting stories of brave deeds in war and in peace

Outline of Topics

1. The scene.
2. The occasion.
3. The dangerous journey to warn the British.
4. The results of her bravery.

LAURA SECORD

1. The United States and Canada lie very near to each other along the Niagara River, especially below Niagara Falls. It was natural, therefore, that the Niagara district should be a battleground during the unfortunate times of trouble between England and the United States. It was easy for an army to cross the river in a few hours, and the people of the Niagara district in Canada suffered more in early years from invasion by armies from the United States than those living in any other part of Canada. The loyal people of the Niagara frontier should be gratefully remembered by all true Canadians.

Too often the men only are praised for their noble deeds during the war. In many cases women are called upon to endure more hardship than men, and when called upon to do so they share the terrible burdens of war as courageously as men, and prove that they are equally loyal and patriotic.

In the little village of Queenston on the Niagara River, seven miles from its mouth, and close to the frowning heights named after it, the inhabitants were on two occasions compelled to entertain United States soldiers who had crossed the river from Lewiston to invade Canada.

2. In 1813 a United States army under Major Boerstler camped in the village. The soldiers took possession of the homes of the Canadians, and met with no opposition, as there were no Canadian soldiers in the neighborhood. In their quiet home, James Secord and his wife, Laura, were forced to receive very unwelcome soldier guests. Secord had been fighting for his country and flag at Queenston Heights when an American bullet had brought him low. The soldiers, believing themselves secure from any interference by a wounded militiaman and his wife, talked loudly one night about their plan of campaign. Secord and his wife, instead of sleeping soundly, listened to the conversation and heard clearly that they proposed to hasten on towards Hamilton and surprise the small bodies of British troops on the way.

THE LAURA SECORD MONUMENT

Mrs. Secord knew that Colonel Fitzgibbon had a small body of British and Canadians at Beaver Dams, about halfway between Queenston and Hamilton. The problem was how to warn him. Secord himself was helpless, but Mrs. Secord, realizing the danger, said quietly that she would go. A great wilderness had to be traversed, not by a strong, healthy man accustomed to hardship, but by a small frail woman of forty. Her husband tried to dissuade her, but when she insisted he agreed and bade her God-speed.

3. Early next morning she prepared breakfast both for her family and for the soldiers quartered in her home, and then in the most natural way possible, left the other members of the family to wash the dishes and attend to the other household duties, while she went to the field to milk her cows. The pasture field was near the woods—most of the country was covered with the original forest at that time. Pail in hand she approached the cows, and managed to frighten one of them so that she ran into the woods. Mrs. Secord, pretending that she was trying to catch the cow, ran after her.

Once out of sight she dropped her pail and started on her long and dangerous journey through the wilderness to reach Colonel Fitzgibbon before the soldiers of the invading army could reach him by the road. She knew that she might meet with great dangers from wild animals. She knew there were Indians not always to be trusted who might molest her, but she was true to her high purpose. Canada must be saved. She determined to help in the good work of saving it to the utmost of her power. For more than twenty miles she struggled on heroically. Her clothes were torn by briar bushes. She found swollen streams over which she had to creep on trees that had fallen across them. She was tired and hungry, but undaunted still she pushed on, true to her purpose, strong because of her patriotic determination to save her country.

She reached Colonel Fitzgibbon in the evening. She was in time. Gratefully he heard her story, and as soon as he had made arrangements for the proper care of his noble messenger, he prepared to take full advantage of the information which she had brought. He had comparatively few men, but he knew the invaders would have to pass along a road that ran through a deep ravine whose sides were heavily wooded. He knew too that they would probably try to reach his encampment during the night in order to surprise him. He decided to give the surprise himself, and meet the enemy at the ravine before they reached his camp. He had only a small body of troops, but he placed them in the woods on both sides of the ravine, and distributed the Indians he had with them along the lines, with instructions to give their wildest "war whoops" as soon as the firing began. His men were separated widely so that they made a long line on both sides of the road.

4. On came the unsuspecting invaders. Tired and hungry they were, but buoyed up with high hopes of plenty of refreshments when they reached the British camp, and secured the supplies. Suddenly Colonel Fitzgibbon gave the signal, and the startled soldiers from the United States found themselves between two lines of fire, and heard for the first time the terrible war whoop of the Indians. In the night, the Indian war cries and the reports of the guns echoing through the woods gave the invaders the impression that they were surrounded by an army of thousands, and their leader promptly surrendered. The battle of Beaver Dams completely upset the plans of the United States general, and Colonel Fitzgibbon generously gave Laura Secord credit for his victory

HOME OF LAURA SECORD AT CHIPPEWA, ONTARIO
Where she lived from 1835 to 1855

Laura Secord lived to be a fine old lady. She was buried in the historic graveyard in which the fiercest fighting at the battle of Lundy's Lane took place, close to the trenches where the heroes on both sides who fell in that battle lie.

Calm and serene, her bronze face looks out inspiringly from the top of the monument erected by a grateful people.

as if her heart were full of thankfulness because it had been her privilege to do her duty in helping to maintain the connection between Canada and England.

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51. Type Study on Steamboat Traffic on the Saint Lawrence River.

Suggestions as to Method

(*a*) Study a large map of the Great Lakes and the St. Lawrence with its tributaries

(*b*) Make a map of the St. Lawrence from Kingston to Montreal showing the rapids and canals and the two lake expansions

(*c*) Make a map of the St. Lawrence from Montreal to Belle Isle indicating Lake St. Peter, the ship channel, tributaries, and ports

(*d*) Make a sketch map of the St. Lawrence system, showing by diagrammatic lines the importance of Montreal as a receiving and distributing centre. Note the connection between the St. Lawrence River and the great Canadian railway systems.

(*e*) Make a collection of literature relating to the river. The Dominion and the Provincial Governments and local Boards of Trade issue enough free literature to constitute a whole library of Canadin geography. Such a library is a valuable basis for intelligent patriotism Have pictures of river boats, lumber rafts, sailing vessels, ocean vessels and canals

(*f*) Recall the story of Cartier's voyage (1535-6), the expeditions of Champlain, the Jesuits, and La Salle

(*g*) Develop the type study in a series of short lessons, following the outline of topics.

Outline of Topics

1. Description of the St. Lawrence from the standpoint of navigation.
2. Early navigation above Montreal.
3. Early navigation below Montreal.
4. The river steamboat below Montreal.
5. The river steamboat above Montreal.
6. The ocean steamship on the St. Lawrence.

STEAMBOAT TRAFFIC ON THE ST. LAWRENCE RIVER

1. For fifty miles after it leaves Lake Ontario, or from Kingston to Brockville, the St. Lawrence flows through the Thousand Islands, where a broad spur of the Laurentian

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PASSING THROUGH THE LACHINE RAPIDS

PASSING THROUGH THE LACHINE RAPIDS

Highland crosses the river into the state of New York. From Brockville to Montreal it runs through flat-bedded limestones with rapids at several points, the total descent being more than two hundred feet. The first series of rapids, terminating in the nine-mile stretch appropriately called the Long Sault, is followed by Lake St. Francis, a sheet of water twenty-three miles long, and the second series by Lake St. Louis, fifteen miles long, below which occur the Lachine Rapids, with a fall of forty-five feet to Montreal. From Montreal to Three Rivers, where the tide is first felt, the descent is only twelve feet, the river flowing through an alluvial plain. This section of its course includes Lake St. Peter, the largest of its three lake expansions, into which flow three important tributaries, the Richelieu, the Yamaska, and the St. Francis. Although six miles wide, this lake has a practically uniform depth of only ten feet. A ship channel, nearly sixteen miles in length, affords a passage for vessels drawing thirty feet of water. At Quebec, meaning "the narrows," the river is shut in between rocky banks and the tides range from ten to fifteen feet. For the remainder of its course the river is navigable for the largest vessels.

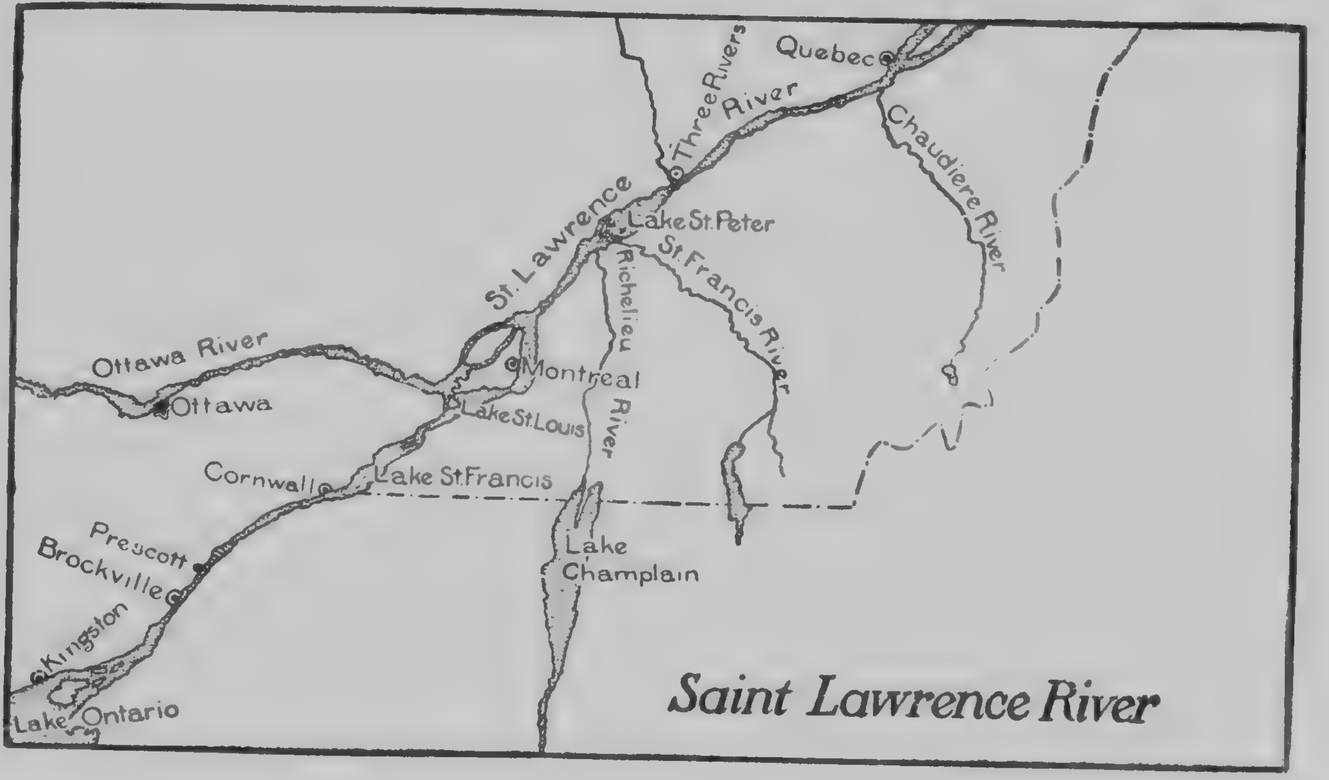
2. In studying the history of navigation on the St. Lawrence, it will be convenient to make two sections of the river with Montreal as the dividing point, just as today this Canadian metropolis is the meeting place of sea-borne trade on the one hand and river and rail-borne trade on the other. Above Montreal, the river craft has been marked by four progressive stages, the canoe, the bateau, the barge or Durham boat, and the steamboat.

The French pioneers found the Indian canoe the ideal craft for the broken but sheltered waterways of New France. It could be readily carried past rapids or dragged through them, and because of its buoyancy and elasticity it could descend the same rapids with but little danger from the water-worn rocks. Within certain limits it met the demands of all travel and traffic, for it could be constructed to carry a cargo of twenty-five to forty men or three tons of merchandise.

Greater traffic called for larger craft, and the bateau appeared—"a flat bottomed skiff, sharp at both ends, about forty feet long and six to eight feet wide in the middle and capable of carrying about five tons." Sometimes the bateaux were confined to a particular reach of water; in other places they were, with the aid of ropes and windlasses, men and oxen, dragged up the shallow rapids, or were unloaded and carted across the portages. They were provided with masts and lug-sails, an anchor, four oars, and six setting-poles shod with iron and were manned by a crew of four men and a pilot. With forty barrels of flour on board, a bateau drew only twenty inches of water. It could not be capsized in the excitement of a rapid, while its light draft enabled it to creep up along shore, and its "sharp bows made it a tolerable sailer and not difficult to row."

The bateaux were used by the United Empire Loyalists in reaching their settlements on the St. Lawrence and the Bay of Quinté, and they continued to be the prevailing type of transport until the War of 1812. After the war, Durham boats were introduced. "These were flat-bottomed barges with keel and centre-board and rounded bows; eighty to ninety feet long, with a capacity about ten times that of a bateau, or about 350 barrels of flour." They carried heavy cargoes of agricultural produce down the river from Upper Canada and brought back lighter cargoes of settlers' provisions. They were forced upstream by means of long setting-poles, the crew walking from stem to stern with the aid of cleats fastened to the deck to give them foothold.

The voyage of a Durham boat is described by a contemporary as "a very tedious one, depending on a favoring easterly breeze in traversing the lakes and quieter portions of the river, and on the dexterity of the boatmen who wielded the setting-poles in swifter water, where they were liable to be detained for hours, sometimes for days, contending against the swift currents, subject to the mishaps of grounding or being damaged by boulders, or worse still of being swept down the rapids, sometimes with the loss of the oxen and horses which had


Saint Lawrence River
Quebec
Three Rivers
River
St. Lawrence
Lake St. Peter
St. Francis River
Chaudiere River
Richelieu River
Montreal
Ottawa River
Ottawa
Lake St. Louis
Cornwall
Lake St. Francis
Prescott
Brockville
Kingston
Lake Champlain
Lake Ontario

them in tow, and in some instances with loss of the boat and cargo."

The Durham boat never displaced the bateau on the St Lawrence. For twenty years after the close of the War of 1812, the number of bateaux using the canals averaged nine hundred annually. In 1832 from six to eight hundred Durham boats and about fifteen hundred bateaux passed the locks.

3. Let us now trace the progress of early navigation upon the lower section of the St. Lawrence, from Montreal to the sea. Jacques Cartier, who gave the river its name, sailed up its waters in 1535 with a fleet of three small vessels, ranging in size from forty to one hundred and twenty tons. After passing the mouth of the Saguenay, Cartier experienced considerable difficulty. "In the present day, when the river has been surveyed and charted minutely, and when the channel is lighted like a city street, it is easy to pass up or down, but Cartier's seamanship was here strained to the utmost." Leaving the two larger vessels at Stadacona, now Quebec, Cartier attempted to make Hochelaga, now Montreal, with the forty-ton *Emerillon*. At the head of Lake St. Peter he found a group of low islands, among which he had to search for the channel. The water became very shallow, and the remainder of the journey had to be made in small boats.

It was almost three-quarters of a century later before Cartier's feat was duplicated by Champlain, with whom the active and continuous navigation of the St. Lawrence really begins. Trade and navigation grew but slowly, however, throughout the French régime. In 1754 the total number of vessels engaged in foreign trade with the colony was only fifty-three, while the total value of exports, principally furs, did not much exceed £75,000.

After the fall of Quebec, trade grew more rapidly. In 1811, when the lumber trade was beginning to expand, 582 sailing vessels arrived at Quebec. In 1851 the number had risen to 1300. Ship-building, too, grew apace, the output of the yards at Quebec alone being over two vessels a week in the prosperous years of 1864 to 1866. LeMoine in his "Chronicles of the Saint Lawrence," relates many interesting incidents of the days of sailing vessels. He described the floating lightship at the Traverse "which remains there from April to December, each evening hoisting to the masthead its lantern for the guidance of the thirteen hundred square-rigged ships sent out from Britain to denude our forests of their priceless wealth." In our day the sailing vessel has almost disappeared from the North Atlantic route. For the fiscal year 1910-11 only one sailing vessel from the sea was entered at Quebec, while the number of steamships from the sea was 400.

4. The first steamboat, *The Accommodation*, appeared on the St. Lawrence in 1809, two years after Fulton's *Clermont* appeared on the Hudson, but two years before the *New Orleans* appeared on the Mississippi, and three years before Bell's *Comet* appeared on the Clyde. Croil states that "*The Accommodation*, built by the Hon. John Molson of Montreal, made her maiden trip to Quebec on November 3d, 1809, carrying ten passengers in thirty-six hours' running time. In accordance with the usual custom, which continued for many years, she anchored at night, so that the whole time occupied in the voyage was sixty-six hours. If she ascended the St. Mary's current (the passage between Montreal and Isle Ronde, 1300 feet wide, with a current of about five miles an hour) she was towed up by oxen. The length of this vessel was eighty-five feet over all, her breadth sixteen feet, her engine was of six horsepower, and her speed five miles an hour."

The Quebec *Mercury* gave a detailed account of the vessel and her arrival. Crowds hurried down Mountain Hill all day to see the wonderful vessel, and she was "incessantly crowded with visitors." "This steamboat receives her impulse from an open double-spoked perpendicular wheel on each side without any circular band or vine. To the end of each double spoke is fixed a square board which enters the water, and by the rotatory motion of the wheel acts like a paddle. The wheels are put and kept in motion by steam operating within the vessel. No wind or tide can stop her."

Up to about 1818 many preferred to drive all the way from Montreal to Quebec in caleches over rough roads. Now, however, that the steamboats had comfortable cabins and canvas awnings over their decks, they secured nearly all the through passenger traffic."

The *Canada*, which came out in 1837, was 240 feet long, and was accounted the largest and fastest steamer then afloat in the New World. About 1845 several other famous boats were built. The *John Munn* was longer than any previous, or, indeed, any subsequent river steamer on the St. Lawrence, being 400 feet in length. She proved much too large for the trade.

In numbers as well as in size, vessels were produced in advance of the requirements of the route. In 1857 there were four rival lines of steamers plying between Montreal and Quebec, and the excessive competition reduced the cabin fare to one dollar including meals and stateroom, while steerage passage could be had for one eighth of that sum. "The excitement that prevailed at this time was intense. The arrival and departure of the boats at either end of the route were scenes of indescribable confusion. Vast crowds of people assembled on the wharves, while clouds of smoke issuing from the funnels, and the roar of escaping steam plainly indicated that the stokers were doing their best to burst the boilers. This vicious and ruinous opposition was brought to an end by a tragic occurrence, the burning of the steamer *Montreal*, when two hundred and fifty-three persons perished." Superfluous boats were now withdrawn, and the Richelieu Company absorbed most of the passenger business. This company and the Canadian Steam Navigation Company were amalgamated in 1875 under the name of the Richelieu and Ontario Navigation Company, which today maintains a fleet of twelve steamers for tourist traffic upon the great scenic and historic waterway.

5. While the steamboat first appeared below Montreal in 1809, its advent on the section above Montreal was retarded by the character of the river itself. As early as 1700, the

Sulpicians, who were seigneurs of the whole island of Montreal, had attempted to overcome the difficulties of navigation between Lachine and Montreal, but this formidable task was finally abandoned and nothing of importance was accomplished during the remainder of the French régime. In 1779, under the direction of Governor Haldimand, the improvement of the channel was commenced. Three small canals were constructed by the Royal Engineers to connect Lake St. Louis with Lake St. Francis. These canals, the first to be constructed on the continent of America, provided the bateaux with but three feet of water. The Lachine canal, completed in 1825, gave barges or Durham boats a depth of five feet. In the next quarter of a century all the existing canals were enlarged into ship canals, and new ones were completed giving steamboats nine-foot waterway, since deepened to fourteen feet, from Montreal to the head of the Great Lakes.

Before the enlarged canals were completed there were passenger steamboats on Lake St. Francis and Lake St. Louis, and the steamers from Lake Ontario descended the river to Prescott, below which the rapids begin, while a smaller steamer ran farther down to the head of the formidable Long Sault. Passengers leaving Kingston in the morning reached Montreal the same day, the route embracing steamboat and stage-coach, the drive past the Long Sault alone being no less than twelve miles.

The early river boats gave but little promise of evolving into the palatial tourist craft of the Thousand Islands with observation parlors and observation dining rooms above deck The gentlemen's cabin and the ladies' cabin were both below deck, the former being made to serve the double purpose of salon and dining room.

The first large boat to run the Long Sault was the *Ontario*, in 1843. Built upon the lake of the same name, this speedy vessel was being brought down the St. Lawrence to be placed on the route between Montreal and Quebec at the time when large vessels were plying there. Two Indian pilots, the most skilful on the river, were engaged for the attempt, which was accounted so difficult that each pilot was to receive a thousand dollars if successful. George Waldo Brown thus recounts the story as described by Captain Johnston: "First a crib was made forty feet square with pine floats ten feet apart with stakes ten feet long driven in each square projecting downwards. When all was ready, some Indians were sent to the foot of the rapids and some were stationed in the trees on each side of the rapids. Several Indians towed the crib to the head of the rapids with their canoes, and let go of it. Then every Indian watched the course it took as the crib sped its way with the current of the stream. When it reached the foot of the rapids it was turned over and it was found that none of the stakes were broken. That was a positive indication that there was enough water to run the *Ontario* through. The Indians then boarded the steamer. Each Indian piloted the *Ontario* as far as he had observed the crib's course. The only white man on board was the engineer, who also received one thousand dollars." It was not until the enlarged Lachine Canal was opened in 1848, however, that the steamers began to run all the rapids, a practice which today is one of the chief attractions to tourists.

The freight traffic on this section of the St. Lawrence has assumed enormous proportions. In the year 1911, more than three million tons of freight passed through the canals, of which over one million tons were agricultural products, almost one million tons were coal, and half a million tons were forest products. The number of vessel trips for the same period was approximately ten thousand.

6. We have finally to consider the last state in the evolution of the steamer on the St. Lawrence, the coming of the ocean steamship. It was more than twenty years after Molson's *Accommodation* began to ply between Montreal and Quebec, before a steamship was placed on the river below Quebec. In 1831 the *Royal William* was launched at Quebec and towed to Montreal to receive her engines. She was placed on the route between Quebec and Halifax, but after two years, the enterprise not having proved profitable, she was sent to

THE CITADEL AND WATERFRONT OF QUEBEC

London to be sold. This was in the first epoch of the ocean steamship when vessels of the transition type were equipped with both sails and wooden paddles. The *Royal William*, however, crossed the ocean under steam power alone, although it required all the space in her hold to coal her for the voyage. Thus to Canada belongs the honor of having produced the first transatlantic steamship.

About the year 1850 the side paddle on ocean steamers gave place to the screw, and two years later the railway from Montreal to Portland was completed. From these two events the history of the transatlantic steamship upon the St. Lawrence route really dates. In 1852 a Liverpool firm secured a subsidy for an English mail service to Quebec and Montreal in the summer and to Portland in the winter. "The first ocean steamship, the *Genova*, reached Quebec on the 9th of May, 1853, and Montreal on the 13th, when she was visited by thousands, and the event was celebrated by a great and hilarious banquet." The four vessels placed on this route, after giving a more or less irregular service were withdrawn to be used as transports in the Crimean War.

A new contract was now made with Mr. Hugh Allan of Montreal for an improved fortnightly service, and from that time, due to the foresight and courageous determination of the Allans, the future of the St. Lawrence route was assured. The fortnightly service soon became a weekly service and vessels of larger tonnage were added. Steady advancement was made in the face of most serious reverses. In eight years the Allans lost many steamships, some of them upon the Atlantic, some of them upon the river itself. "The St. Lawrence from Bic to Montreal, a distance of three hundred miles, contains a series of sunken reefs, shoals and flats, and to make matters worse, the tides do not run true and the channel is often very narrow." The ships had to contend with snowstorms and ice in the spring and fall, and occasionally with fogs in summer. The river, too, was badly lighted, and few of the pilots were then competent to take charge of a large steamship. Indeed "the first steamer lost on the St. Lawrence was run ashore almost under the lamps of a lighthouse in full view, and on a bright calm evening, by an incompetent pilot who had assumed the control on her arrival."

The development of navigation on the lower St. Lawrence has been continuous and rapid, due to the growth of Canada and the continued improvement of the route. Several lines of transatlantic passenger steamships now utilize the route; other well-known companies operate freight ships with limited passenger accommodation; there are lines of steamers to the Gulf, the Maritime Provinces, United States ports, the West Indies and South America, while the boats of the Black Diamond Line bringing coal from Cape Breton are always to be seen upon the river. In 1912, 415 foreign-going steamships entered the harbour of Montreal, 327 vessels arrived from the Lower Ports, and for ten years past, the number of lake vessels arriving at Montreal has ranged from 10,000 to the enormous total of 15,000 per year.

A century ago this great route was pregnant with possibilities, but beset with apparent impossibilities. The possibilities are being realized and the apparent impossibilities are being overcome. Above Montreal the rapids have been surmounted by a series of six great canals, lighted and operated with electricity. Below Montreal the work of developing the route has been varied in its character and almost unlimited in its scope. The most important feature is the St. Lawrence Ship Channel, with a minimum width of 450 feet and a depth of 30 feet at extreme low water. The channel is now being deepened to 35 feet to allow the St. Lawrence river ports to attract ocean steamships of the largest tonnage. The whole route is lighted with lighthouses, lightships, and acetylene buoys, some of the buoys showing a light of more than one thousand candle power a distance of twenty miles. For fog and thick weather warnings, there are diaphones on land, whistling devices on the buoys, and also submarine signals. In addition, the Government has established wireless telegraph stations and numerous signal stations, and maintains a small fleet of ice-breaking steamers. These aids to navigation have earned for the route the reputation of being the best lighted and safest river channel in the world. Every year marks improvements in the river and expansion in its traffic

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52. Type Study on the British Colonies

Suggestions as to Method

(*a*) Study the map of the English colonial possessions on a large globe or world map. The Tarr and McMurry Geography, Part II. p. 274, has such a map of the world

Drill upon the names and locations of the provinces with respect to England the equator and the continents

(*b*) Note the routes of traffic between England and her colonies in different parts of the world

(*c*) In Africa locate the English colonies and spheres of influence and compare with those of France, Portugal and Germany

(*d*) Compare later the colonies of England as a whole with those of France, Spain, Holland and the United States. Contrast the growth of English colonies with the decline of Spain and show causes

(*e*) Compare the colonial empire of England with that of Russia on land and her steadily growing power eastward and southward

(*f*) Make a chart of the world, showing in what parts of the large land areas the English-speaking populations predominate

(*g*) Notice finally to what extent the other continents have been explored and colonized by European nations.

Outline of Topics

1. History of English colonies before the American Revolution.

2. The British in East India.
3. The British in Africa
4. The trade route to India and the East defended by Gibraltar, Malta, Aden, Singapore and Hong Kong.
5. Penal settlements in Australia and their later development.
6. The movement toward confederation of the Australian colonies.
7. The Crown colonies and how they are governed.
8. The growth of English colonies.
9. The growth and decline of Spanish colonies.
10. Portuguese colonies.
11. Dutch, French and other colonies
12. General conclusion regarding European colonization in the last four centuries.

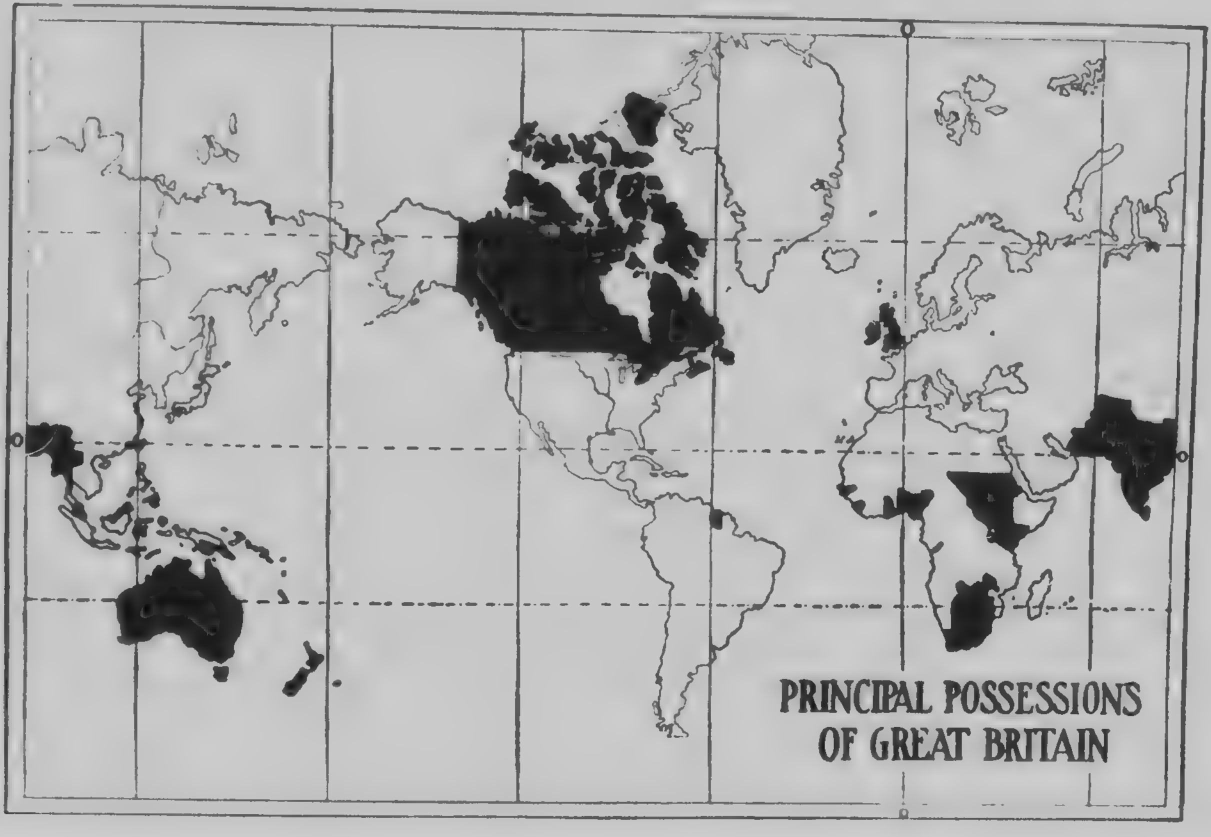
THE BRITISH COLONIES

1. England is that country in Europe which has the largest number of important colonies, distributed throughout the different continents and oceans.

Just before the American Revolution the English had gained possession of the better part of North America, with the thirteen colonies and Canada. Canada had been originally explored and settled by the French under such daring leaders as Cartier, Champlain and La Salle. The region of the Great Lakes and the Mississippi to its mouth was occupied by French settlements and trading posts.

But the last French and Indian war had left England in 1760 in possession of the whole of Canada and of the eastern half of the Mississippi Valley.

But the American Revolution in turn separated from England a large part of her American possessions and appeared, at the time, to be a fatal blow to her colonial development. England, however, had learned from her bitter experiences with America some important lessons in regard to the treatment of colonies.



PRINCIPAL POSSESSIONS
OF GREAT BRITAIN

2. The period just following the American Revolution saw the rapid development of British colonies in many parts of the world. Before the Revolution the British East India Company of Merchants had important trading posts in India. During the seventeenth century the English company had established forts and trading posts at Bombay, Madras, Calcutta and at other places on the Indian mainland. The French were trying at the same time to surpass the English by founding trading posts on the coast of India. There was a fierce struggle between the English and French in India which came to war. A young Englishman named Robert Clive was a clerk in the service of the East India Company at a trading post on the east coast. When the war broke out he showed a remarkable ability in leading the few English troops and the natives against the French. For about sixteen years, from 1751 to 1767, he carried on a successful war and drove the French out of India, establishing the East India Company in control along the coast. Warren Hastings, following Clive, carried on war against the native princes and enlarged the territory of the India Company. Warren Hastings was cruel in his treatment of the natives of India, and was tried before Parliament in England, but was acquitted.

Just after the American Revolution the British government assumed control of the East India Company and appointed a governor-general to manage the political affairs of the colony, leaving the company to direct trade and commerce.

Lord Cornwallis, who surrendered at Yorktown, was the first governor-general of India. He also conducted wars against the natives and enlarged the territory held by England in India.

The East India Company proved incompetent to manage the affairs of this vast empire. In many ways it had acted unjustly toward the natives of India. Parliament finally put an end in 1858 to the company, paid the stockholders a sufficient sum, and the British government took full control of the colony.

In 1877 Queen Victoria was proclaimed Empress of India. At this time England rules directly over 221,172,952 people in India. In addition to this the English government rules indirectly through its influence over 66,005,479 people in what are called the "feudatory states."

In these later years, by establishing courts of justice, by building railroads and irrigation canals, the government has done much to improve the condition of the people of India.

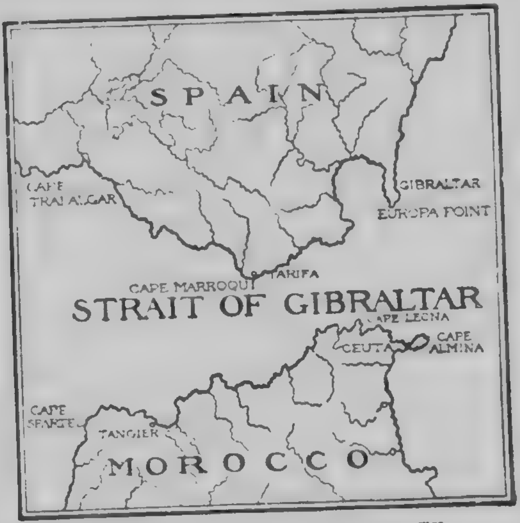
3. South Africa at Cape Town was settled first by the Dutch in 1650, and the district about the Cape was occupied by Dutch farmers till 1795, when the fort was captured by the British. Having been given back to the Dutch it was recaptured during a war with Holland in 1806 and finally secured by England by a payment of thirty million dollars to Holland.

The British government was doubly desirous of securing this territory, first because it was the most important station on the route between England and her possessions in East India. Before the Suez Canal was built, England greatly needed Cape Town as a naval station. Second, Cape Town and settlement was the best point from which to extend the power of England over South Africa. For a long time it was difficult to persuade Englishmen to settle in South Africa, and this colony remained for many years poor and weak.

But in 1870 the diamond fields were opened up, and Englishmen flocked into South Africa. England has had no end of trouble in South Africa with the Dutch Boers, with the fierce tribe of Kaffirs, with the Zulu tribes, and last with the South African Republic, called the Transvaal, but England has gradually extended her domains northward.

In the latter part of the nineteenth century England gradually acquired a controlling hand in the affairs of Egypt. At first France and England exercised a joint control. In 1882, France withdrew, and England, which had long desired to control Egypt on account of its nearness to the Suez Canal, began to exercise a protectorate over Egypt. War broke out with the Soudan, which England finally conquered under Lord Kitchener's leadership, and the English power extended southward. This gave England control in both the north and the south of Africa and led the English people and statesmen to the idea of a great political and traffic route from Cairo to the Cape. It now appears that this is soon to be realized.

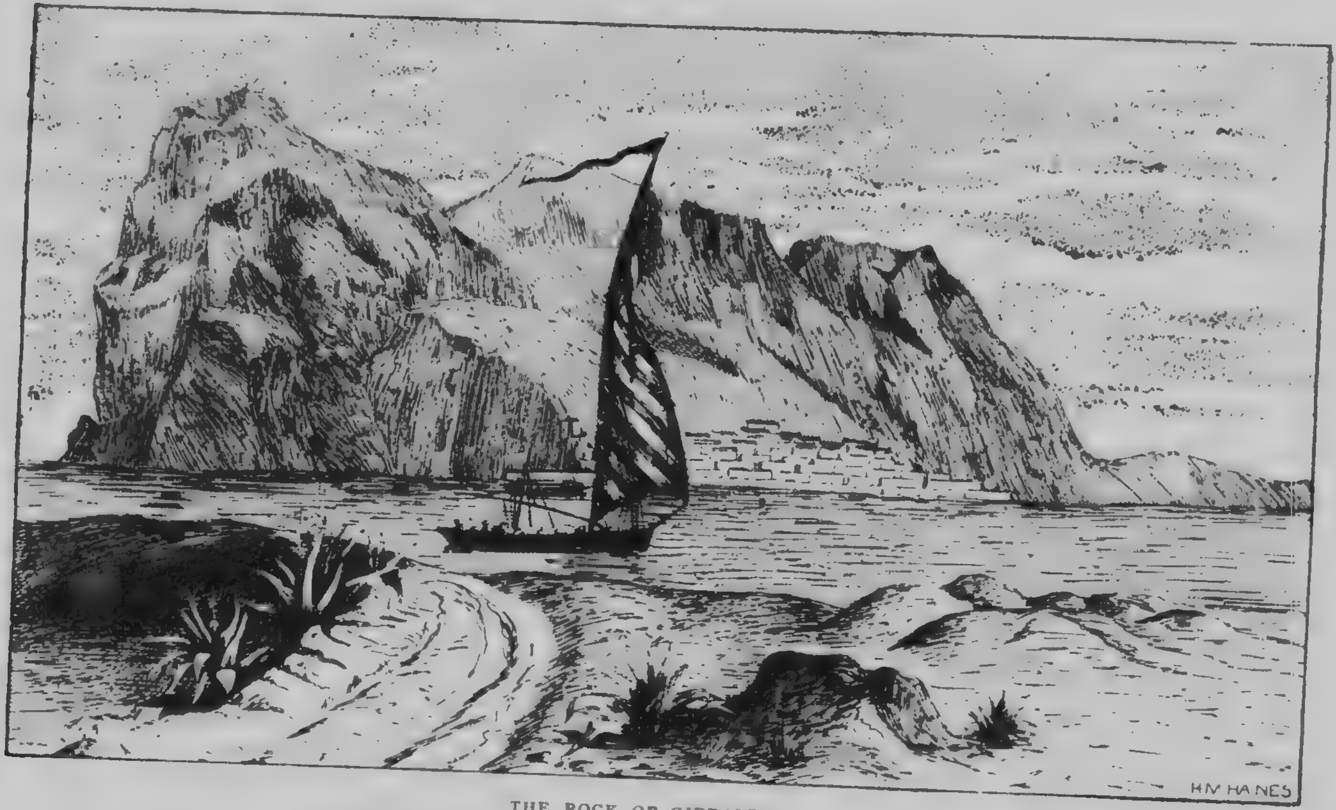
In the latter part of the nineteenth century England had also gained control of a large territory on the lower Niger River and several smaller portions to the west of the Gulf of Guinea.



MAP OF GIBRALTAR AND VICINITY
Showing the great strategic value of England's stronghold in the Mediterranean

4. In order to control the trade routes to India England has acquired possession of Gibraltar, Malta and Aden. Gibraltar was captured from Spain two hundred years ago and has been greatly strengthened by expensive fortifications. Malta is a powerful military and coaling station in the center of the Mediterranean. Aden, at the outlet of the Red Sea, has been constructed into a great fortress similar to Gibraltar. Singapore, at the end of the Peninsula of Malacca, and Hong Kong, on the Chinese coast, are also strong military and naval stations, which are strengthened at vast expense to protect British commerce in time of war.

5. Australia was explored by the English under Captain Cook in 1769-70. This new country was so far away that the English government decided to send their convicts from



THE ROCK OF GIBRALTAR
As seen from the shores of Africa about ten miles distant

the prisons to the east coast, and for many years, till 1830, they were transported thither to the number of 2,000 or 3,000 a year. They were under military control and were compelled to work and earn their food and other supplies. They suffered great hardships and were cruelly abused by the soldiers. Before 1836 it is estimated that 103,000 criminals had been transported by England to Australia and Tasmania. In 1840 there were 40,000 of these convicts living in Australia, more than half the population of the country at that time.

The introduction of sheep and the production of a fine quality of wool for export to England encouraged immigration. Cheap land also attracted settlers. The convicts were kept building roads and worked as servants to the farmers.

In 1851 gold was discovered and people flocked to South Australia from all parts of the world. In a couple of years Melbourne had a population of 200,000.

Between the years 1850 and 1865, 761,000 people came to Australia, mostly of the English-speaking classes. Many of these were adventurers, and a period of disorder followed for a time. But as the gold fever gradually subsided, people turned more to the settled occupations of farming, stock-raising and commerce; coal, copper and silver were discovered in other parts of the country. Sugar and cotton plantations were developed in the warmer parts of Australia in the northeast. An excellent system of schools was established; roads were built, and a railroad system began to connect the colonies.

6. As population and settlements increased, the different states began to come closer to each other and to work together for common interests. They began even to talk of a confederation of the Australian states under one general government.

From 1852 on the sentiment grew more favorable to the confederation of the colonies under one government, and various conventions were held to devise a plan of union. A constitution similar in many respects to that of the United

States was worked out. After various attempts to reach an agreement, a constitution was adopted, and the "Commonwealth of Australia" was established by agreement of all the states in 1900.

This government, which unites all of the states of Australia into a federal union, has a legislature of two houses elected by the people, a judiciary and a governor-general appointed by the crown.

The government of Australia is like that of Canada, which is also a federation of states with independence in all local and purely Canadian affairs.

Quite recently the South African colonies have formed a similar union of federated states which in time seems destined to grow into a powerful nation.

Among the English colonies therefore there have developed three great federal states, Canada, Australia and South Africa, all based upon an organization of government similar to the United States.

New Zealand also is a free, self-governing state of Englishmen, having its own legislature and receiving its governor-general by appointment from the crown.

7. Nearly all the other colonies of England are crown colonies, that is, controlled directly by the government of England and without independent law-making assemblies of their own. The English Parliament legislates for the crown colonies, such as India, the Soudan, Jamaica and other islands in the West Indies and East Indies. The crown colonies are peopled by alien races not speaking the English tongue, that is, races not yet sufficiently developed to be self-governing.

8. At various times, partly by war with European states, England has gained possession of important islands; in the East Indies, for example, Ceylon, parts of Borneo and New Guinea, the Solomon and Fiji Islands; in the West Indies, Jamaica, and the Windward Group; in the Atlantic, the Falklands, St. Helena, Bahamas and Burmudas; in the Pacific several smaller groups. In Africa and Asia England

has enlarged her territories by gradually increasing her "spheres of influence" as in Egypt, the Soudan and South Africa.

In these various ways the British Empire has grown till it comprises a land area of more than eleven million square miles, or about one-fifth of the total land area of the world. Much of this lies in the temperate and more habitable parts of the earth where the stronger races develop.

9. In the period following the discovery of America, Spain, by exploration and conquest, got possession of the West Indies, Mexico, most of the states of South America and parts of what is now the United States, besides the Philippines. Spain acquired great wealth by the conquest of Mexico and Peru, and during the sixteenth century surpassed England and other nations of Europe in commercial and colonial enterprise. But Spain was harsh and cruel in her treatment of subject races, and when, later, England, Holland and France began their colonial schemes, Spain fell behind in the competition and gave up, one after the other, nearly all her colonies. Today she has almost no colonial empire.

10. Portugal also, for a short time, was very successful in gaining colonies in Africa, East India and South America, but like Spain, Portugal has lost most of her colonies.

11. Holland, though a small nation, acquired during the sixteenth and seventeenth centuries great influence as a colonizer in East India, in Africa and to some extent in America. Some of her important colonies, like Java, she has held to this day.

The French also gained important colonies in Canada, East India and Africa. While France has lost some of her best possessions, she still owns large areas in northern Africa and in East India.

12. In summarizing, we may say that during the last four centuries the European nations have explored and taken possession of all the new continents, as South America, North America, Australia and very important parts of Asia, besides

many important islands. Spain began as the great leader in colonization but gradually lost her influence. England began feebly, but is now the greatest of all the colonizing nations.

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CHAPTER FIVE

SPELLING AND PENMANSHIP

SPELLING

1. Conditions. Thousands of young people yearly go from the public schools to business positions in which they are required to make practical application of the knowledge of English which they have obtained. Unfortunately, many fall far short of the standard which they are supposed to have reached; and failure to teach the pupils to spell is one of the most common charges brought against the public schools as a cause of this shortcoming. Results of many tests of pupils made throughout the country show conclusively that in many instances these charges are well founded, and, notwithstanding the fact that the complaints have been reiterated for many years, conditions seem to be but little improved. Methods of teaching spelling, therefore, should receive careful attention.

2. Value of Spelling. Spelling is a practical, rather than a cultural, study, and when considered from a practical point of view it is found to possess commercial value. Business men will not place in responsible positions those who cannot spell correctly. Moreover, most firms are particular about their correspondence, and employers cannot afford to spend time in correcting errors in language and spelling that are made by a stenographer or a clerk. Ability to spell correctly, therefore, is essential to securing and retaining a good position. Lack of this accomplishment keeps many young people in inferior positions, at low salaries.

While emphasizing the practical value of spelling, we should not entirely overlook its cultural value. This is seen in its effect upon the individual. The person who is not sure of his spelling is never at ease when required to write even the simplest form of paper or letter, and the discovery of his errors by another is often humiliating in the extreme.

"It is no particular credit to be a good speller, but it is a disgrace to be a poor one." For these reasons, the importance of learning to spell should be emphasized in the intermediate and grammar grades.

3. Causes of Poor Spelling. In teaching spelling, certain difficulties are encountered, and these must be understood and conquered, if one is to succeed. Among these difficulties are the following:

(a) STRUCTURE OF THE LANGUAGE. The English language is chiefly the result of the union of two languages—the Anglo-Saxon and the Norman-French. But this result has been greatly modified by other languages and by changes due to the dialects used by the early English-speaking people in different localities. The spelling of the Anglo-Saxon and Norman-French was largely phonetic, but changes and interpolations destroyed much of this style; then, too numerous additional changes were introduced by Gutenberg, the inventor of printing, and his immediate successors, who tried to engraft Dutch spelling upon English words. Again, the alphabet does not contain enough characters to represent all the sounds in the language, so that some letters, as *a* and *e*, for instance, have several sounds. In numerous words the spelling does not indicate the pronunciation of the word, and in others the pronunciation does not indicate the spelling.

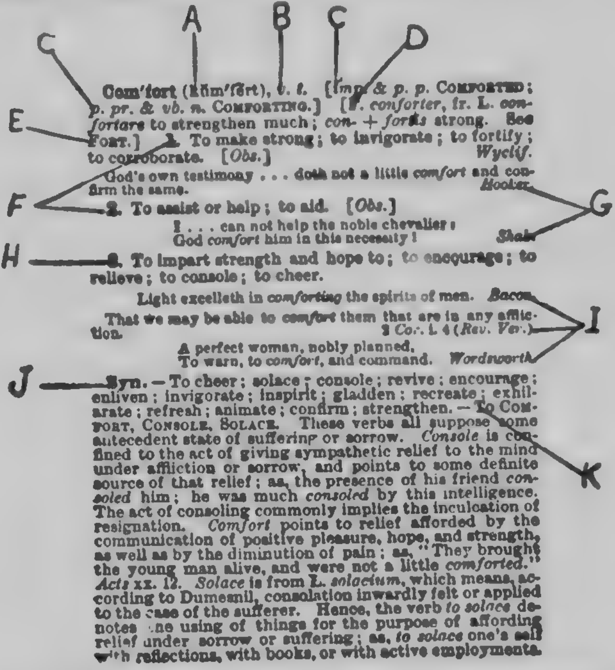
For some unknown reason, these early spellings were handed down from one generation to another until they were introduced into the first English dictionary. This gave them a permanent character, so that a large number of them, awkward and absurd as they are, have been retained to the present time. There has been, however, considerable progress in simplifying some spellings, and a large number of able scholars are still working on the problem. Because of prejudice and invested interests in dictionaries and other works of reference, the progress of these people is necessarily slow, but gradually the simplified forms are working their way into use. Regardless of this, the standard forms are those generally accepted, and are those which we are compelled to employ.

What A Large Dictionary Tells About A Word

A. It gives the pronunciation. (A list of familiar words at the bottom of each page shows the value of the diacritical markings.)

B. It tells the part of speech of a word, and, in the case of a verb, whether it is transitive or intransitive. (A *List of the Abbreviations Used in This Work*, given just before the beginning of the dictionary proper, explains all abbreviations.)

C. It gives the imperfect, past participle, present participle and verbal noun forms of a verb.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Com'fort (kŭm'fērt), *v. t.* [*imp. & p. p.* Comforted; *p. pr. & vb. n.* Comforting.] [F. *conforter*, fr. L. *confortare* to strengthen much; *con-* + *fortis* strong. See Fort.] **1.** To make strong; to invigorate; to fortify; to corroborate. [*Obs.*] *Wyclif.*

God's own testimony . . . doth not a little *comfort* and confirm the same. *Hooker.*

2. To assist or help; to aid. [*Obs.*]

I . . . can not help the noble chevalier:
God *comfort* him in this necessity! *Shak.*

3. To impart strength and hope to; to encourage; to relieve; to console; to cheer.

Light excelleth in *comforting* the spirits of men. *Bacon.*

That we may be able to *comfort* them that are in any affliction. 2 *Cor.* i. 4 (*Rev. Ver.*)

A perfect woman, nobly planned,
To warn, to *comfort*, and command. *Wordsworth.*

Syn. — To cheer; solace; console; revive; encourage; enliven; invigorate; inspirit; gladden; recreate; exhilarate; refresh; animate; confirm; strengthen. — To Comfort, Console, Solace. These verbs all suppose some antecedent state of suffering or sorrow. *Console* is confined to the act of giving sympathetic relief to the mind under affliction or sorrow, and points to some definite source of that relief; as, the presence of his friend *consoled* him; he was much *consoled* by this intelligence. The act of consoling commonly implies the inculcation of resignation. *Comfort* points to relief afforded by the communication of positive pleasure, hope, and strength, as well as by the diminution of pain; as, "They brought the young man alive, and were not a little *comforted*." *Acts* xx. 12. *Solace* is from L. *solacium*, which means, according to Dumesnil, consolation inwardly felt or applied to the case of the sufferer. Hence, the verb *to solace* denotes the using of things for the purpose of affording relief under sorrow or suffering; as, *to solace* one's self with reflections, with books, or with active employments.

D. It indicates the language and word from which the word is derived. In such a case as the word cited above, it shows that instead of the English word and a French cognate both being derived independently from the Latin, the French word came from the Latin and the English from the French. The make-up of the original source-word is also given.

E. It refers to related words, sometimes so different in sound or in present meaning that the relation is not apparent.

F. If the word was once used in a sense in which it is no longer used, the dictionary indicates the fact by the use of the abbreviation *Obs.* (obsolete).

G. Quotations from well-known authors may be given to show how long ago the word was properly used in such an obsolete sense.

H. The dictionary gives the various meanings of the word, grouped under different numbers.

I. It illustrates the proper use of a word by showing how some good author has employed it.

J. It gives a list of other words of identical or almost identical meaning.

K. It distinguishes, by explanation and illustration, between these words of almost identical meaning.

In some cases more facts are given about a word than are found in the example given above in some cases fewer facts

The above explanations show why there can be but few rules for spelling English words, and one who begins to learn these rules soon finds that each has numerous exceptions. Consequently, the spelling for all except phonetic words must be remembered arbitrarily.

(b) Defective Sense Organs. Primarily, spelling is a form study. The form of the word must be so firmly fixed in mind that it can be reproduced whenever required. Some children are not strongly eye-minded; that is, they do not readily grasp and retain forms. Such children become good spellers only through prolonged practice. Moreover, the eyes of many children are more or less defective, and until this defect is remedied, they do not perceive the forms clearly. Tests often show that poor spellers have defective vision. Again, children who are not eye-minded are usually strongly ear-minded; that is, they perceive words by sound rather than by sight. The spelling of such children is likely to be phonetic; as, *jerney* for *journey; thot* for *thought*, and *site* for *sight*. Defective hearing does not tend to poor spelling, because it throws greater responsibility upon the sense of sight.

While the spelling of some words is not closely related to their pronunciation, in most cases correct pronunciation assists in correct spelling. Pupils who do not understand the pronunciation of a word are more liable to misspell it than those who do. The cultivation of correct pronunciation is therefore of importance.

(c) Lack of Understanding. Pupils spell words much more accurately when they know their meaning and use. To ask children to learn the spelling of lists of words which are entirely strange to them leads to confusion and, often, waste of time.

(d) Haste. In written composition, and especially in writing exercises from dictation, the thought runs ahead of the hand, and this often causes pupils to omit letters or to transpose letters in a word.

(e) Sensitiveness. A child who has a nervous temperament, or who is abnormally sensitive, often becomes confused and writes forms which he did not intend to produce.

(f) POOR TEACHING. The results obtained in spelling depend far more upon the methods employed than upon the time spent upon spelling exercises. The teaching of spelling rarely receives the attention which the importance of the subject warrants, and it is probably true that poor teaching is the most prolific source of the poor spelling charged against the schools.

4. Psychology and Spelling. The old definition of spelling is, "The formation of words by letters;" and too many teachers have confined their notion of spelling closely to this definition. If one would be successful in teaching spelling, one must understand the mental processes involved; and examination shows that these are somewhat complex. Considered from the activities involved, spelling is a *sensori-motor* habit; that is, it includes the action of some of the organs of special sense—sight and hearing and muscular movement, which, in oral spelling, brings the vocal organs into action, and, in written spelling, the muscles involved in writing. It naturally follows that all of the activities connected with spelling should be brought to bear upon it. Oral spelling and written spelling are both valuable, and the results of numerous tests show that the highest percentage of accuracy is secured when both are employed. The successful teacher of spelling will, therefore, use all proper means to fix the words permanently in the minds of the pupils.

5. Selection of Material. There are wide differences of opinion among educators as to the sources from which words for spelling exercises should be taken. One group strongly advocates the use of the spelling book, and the other is emphatically opposed to it.

(a) THE SPELLING BOOK. Those who advocate the use of the spelling book base their claims chiefly upon the following arguments:

(1) The spelling book contains lists of words, systemat-

ically arranged and carefully graded. These are much better lists than can be prepared by the teacher.

(2) Words selected from various branches pursued by the pupils, while they may meet the immediate needs of the schoolroom, do not give the child a sufficiently broad vocabulary to meet the requirements of later life.

(3) Words selected at random are not graded in the order of difficulty, neither are they chosen according to any system.

(4) In copying words into their note books, children are liable to make mistakes in spelling, and thus provide themselves with wrong forms for study.

(b) OTHER SOURCES. The opponents of the spelling book raise the following objections to its use:

(1) Lists of words in most spellers are not suited to the needs of the pupils. They contain many words which the pupil already knows, therefore does not need to study, and many others which he will seldom, if ever, use. Time spent in learning to spell these words is wasted.

(2) Compelling pupils to study words whose meaning and use they do not know destroys all interest in the spelling exercises and therefore violates an important pedagogical principle. One of our leading educators even goes so far as to say, "It is doubtful whether the modern spelling book, with its barren lists of words, made up on the principle of similarity of sound, is not the greatest foe of good spelling."[1]

(3) Since spelling is a practical study, and since in life we spell words only when we write them, spelling should be so related to other studies that its utility will always be apparent. When the spelling book is used, this feature is often lost sight of.

(c) PRINCIPLES OF SELECTION. Between these opposing elements, with their various arguments, the inexperienced teacher is liable to be left in doubt as to the best course to pursue. If she has a course of study, it usually provides for the work in spelling as well as in other branches; but if without a guide, she is often under the necessity of making her own selections. Under such conditions she will find the following principles helpful:

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[1] Superintendent W. H. Maxwell.

(1) Select words in common use. Mistakes are more frequently made in the spelling of common words than uncommon ones. When the child has occasion to use an uncommon word, he looks carefully at its form, and learns its spelling

(2) Select words somewhat difficult to spell. Phonetic words, as *man*, *men*, *lake* and *time*, require little or no attention; but such words as *sight*, *journey*, *thought*, *foreign*, and all others containing silent letters, require a great deal of attention, because their pronunciation does not indicate their spelling. The child misspells many common words of this kind because he knew them by sound long before he saw their form, and his tendency is to spell them phonetically. The association between the phonetic form and the authorized form, as in *jerney* and *journey*, must be broken before the child will spell words of this class correctly.

(3) Select the new words from the lessons in the various branches as they are met from day to day. The spelling of these, however, should be in connection with the regular lesson on the branch in which they are found. A list of these words should be kept by the teacher, and the list can occasionally be used for a review lesson.

(4) A good spelling book is usually a safe guide, especially for the inexperienced teacher. In the rural school it is practically a necessity, because the teacher cannot find time to make suitable selections of words for the different classes. The spelling book, however, should not be relied upon too implicitly. Combinations of lessons taken from the spelling book, with others formed of words selected from the different branches, will yield the most satisfactory results.

6. The Lesson. We have already given the psychological reasons for having both oral and written exercises in spelling, but the spelling lesson demands more attention than it usually receives.

(a) ASSIGNMENT. The lists of words selected for spelling should be scrutinized with care. If taken from the spelling book, the list may contain words which the pupils already know. They should not waste time studying these words, but unless their attention is called to them when the lesson is assigned, pupils in the fourth and fifth grades will spend as much time studying words they know as those they need to learn. Words difficult of pronunciation should have their pronunciation given at the assignment of the lesson. In short, all known difficulties to the study of the lesson should be removed when it is assigned.

(b) THE RECITATION. The spelling recitation should be devoted to spelling, and to spelling only. The study of diacritical marks, pronunciation, derivation and kindred topics should be taken up in other exercises. Their introduction into the spelling exercise leads to confusion.

If the exercise is oral, the pupils should pronounce the word after the teacher, then utter each letter distinctly, dividing the word into syllables by slight pause between them; as in spelling *compound*, the pupil will spell *com* (pause) *pound*. If the exercise is written, pencils, spelling slips, or blanks, should be ready for use before beginning to pronounce the words. Secure the attention of the class, then pronounce the word clearly and distinctly, and *but once.* Repetition leads to inattention and carelessness.

If it is a dictation exercise, choose short sentences which the pupils can understand, and dictate the entire sentence at once, but do not repeat it. Give the pupils ample time to write the sentences, for haste leads to poor spelling.

7. Correcting Errors. The correction of errors is the rock upon which many teachers of spelling become stranded. Too many teachers see so many misspelled words, and nothing more, when the important thing is to analyze the errors, and to the extent of your ability discover the causes which led to them.

(1) So far as possible prevent errors. This is even more important than correcting them, since every time the child

misspells a word, he strengthens his tendency to spell it that way again. Many errors can be prevented if, before writing, the teacher calls attention to those words which are liable to be misspelled. Whenever new words are encountered, attention should also be called to their spelling before the class attempts to write them.

(2) Give the pupil opportunity to correct his errors before he passes his work out of his hands. The purpose of the exercise is to train the pupils in spelling, not to see how many errors they can make. The practice of allowing pupils to correct their own errors encourages them and leads them to put their best efforts into the spelling exercise. Furthermore, it is only justice to the children; they should have the same chance to correct their work that you claim for yourself. Doubtless you seldom allow a letter or other piece of written composition to pass out of your hands until you have looked it over for errors in spelling, punctuation and grammatical construction.

(3) The method of correcting errors will vary with the conditions under which the exercises are given. After the pupils have reviewed their exercises, it is a good plan to have them exchange papers, and as the teacher spells the words, have each pupil check the errors on the paper in his possession. When all of the words have been checked, the pupil correcting the paper should sign his name, or place his initial, at the bottom. The papers should then be returned to their owners, who should proceed at once to correct their errors. This matter of correction should not be left until the pupil studies the next spelling lesson; before that time he may have occasion to write the misspelled word several times, and he will repeat the error each time.

(4) Analyze the errors. This is very important, since it gives a clue to the causes of most of them. Some errors will be found common to the class, and can be treated in special lessons; others will be peculiar to individual pupils, and each pupil to whom this class of errors applies should receive such attention as will enable him to overcome his

difficulty. Some of the errors of this kind are the following: The use of *m* for *n*; transposition of *e* and *i* when they occur together in a word and associating the spelling of words which have similar sounds but are spelled differently, as *scope, sope* (soap); *meet, wheet* (wheat). The child has both words in mind, and lets the first govern the spelling of the second.

(5) Encourage your pupils to do their best. Emphasize the number of words spelled correctly, rather than the number of errors made.

(6) Have the pupils write, again and again, sentences and paragraphs which will include words they are prone to misspell. Follow up each error until the correct form is firmly established. A few words each day studied on this plan will accomplish much more towards securing good spelling than the learning of long lists of words which receive little attention.

(7) Have each pupil write correctly in the back of his spelling blank the words which he misspells at each exercise; later, give him frequent tests on these words.

8. General Suggestions. (1) The final test of one's ability to spell is one's spelling in written composition. Many pupils who spell words correctly when writing them in columns, misspell the same words in paragraphs, and even in short sentences. Therefore, the plan of having pupils write their spelling exercises in sentences and paragraphs which shall include the words studied, should be adhered to closely.

(2) Avoid too long lessons. Pupils in the fourth and fifth grades can master but a few words in a day. Long lessons lead to confusion.

(3) Seventh and eighth grade pupils can often study the structure of words to advantage. A knowledge of derivation and structure is an aid to spelling. For instance, we are more liable to spell *laboratory* correctly if we know it comes from *labor*. A plan for this work is found in Volume Three, pages 140-142, Section 12. The work, however, should be considered as word study, not spelling.

9. Rules for Spelling. Most of the rules for spelling contain so many exceptions that they are of but little practical value. However, the following contain comparatively few exceptions, and can be learned with profit by pupils in the grammar grades. Before they are introduced, the pupils should have a few lessons on vowels and consonants:

(1) Most words ending in silent *e* retain the *e* before suffixes beginning with a consonant; as, *home, homely; like, likely; care, careless.*

(2) Most words ending in *y* preceded by a vowel, retain *y* before a suffix; as, *gray, grayish; pay, payable; journey, journeying.*

Exceptions. Daily, laid, paid, staid, saith, said.

(3) Words of one syllable, and words of more than one syllable with the accent on the last syllable, ending in a single consonant preceded by a single vowel, double the final consonant before a suffix beginning with a vowel, except when the addition of the suffix throws the accent nearer the beginning of the word; as, *prefer, preferred; star, starry; refer, reference, referred.*

(4) Words of more than one syllable, with the accent not on the last syllable, ending in a single consonant, do not double the final consonant before a suffix beginning with a vowel; as, *travel, traveler; group, grouping; answer, answered.*

PENMANSHIP

10. Value. Writing is one of the arts which should be acquired by every child before the end of the school period of his life. While the public schools are not expected to make professional penmen of their pupils, they are expected, and should be required, to so train the children that by the time they have completed the work of the fifth year they can write an even, legible hand with ease and with a fair degree of rapidity. This is the least that will meet the demands of one's business and social relations. Many positions can be filled only by those who write a neat and legible hand. It is an imposition upon one's acquaintances and friends to send them written communications which cannot be easily read. Moreover, serious mistakes are often made because people do not write plainly. For these and other reasons, writing should receive as careful attention as any other branch in the course of study.

11. Conditions Frequently Met. When pupils enter the fourth grade, all habits are in a formative stage. However careful their previous training in penmanship may have been, correct habits of position and movement are not firmly fixed. After the long summer vacation the children will be out of practice, and some of them, at least, will be unable to recall readily the details which they learned in the previous grade. The writing of many of these children will be characterized by wavy lines and poorly formed letters. Some, especially among the girls, will have acquired the finger movement, and their written characters will be so small as to be scarcely legible.

These conditions are due chiefly to four causes—a faulty position at the desk, the child's inability to control his muscular movements, lack of knowledge of the forms of letters, and spending time and energy during the writing period in copying forms instead of in drills designed to fix correct writing habits. Before good results in penmanship can be secured, these difficulties must be overcome. It is, therefore, well for the teachers of intermediate grades to begin the year's work in penmanship with those exercises which are essential to success in this branch.

12. The Teacher's Viewpoint. Many teachers fail to secure satisfactory results in penmanship because they do not study the problem carefully or plan their work systematically. Penmanship is placed in the course of study that children may be taught to write legibly, easily, and with a fair degree of rapidity. The writing lessons are a means to this end, and the teacher should look upon the work in this branch from the viewpoint of its purpose. Writing, when considered from the point of view of its function in a course of study, is vastly more than the copying of forms. Writing is reproducing with pen or pencil the forms of letters which the writer holds in mind, and the combining of these letters to form the words required to express his thought. Every lesson in penmanship has its psychological as well as its physical or muscular phase. "All principles of pedagogy apply to penmanship."

13. The Teacher's Preparation. Too many teachers overlook the psychological phase, or mind side of the subject, when preparing their writing lesson. Unless this phase of the work is most carefully considered, it is impossible to secure the desired results. "The three essentials in teaching writing are form, freedom and interest."[1] Of these, form and interest belong to the mind side of the subject.

(a) FORM. Before the architect can draw the plans for a building, he must have a clearly defined picture of the structure in his mind. Just as truly must the pupil have in mind definite images of the letters before he can write them. Form, then, is in the mind, and the acquisition of form is a mental process. So long as the child is dependent upon the copybook or the blackboard for the forms of the letters, he cannot express himself in writing. The child acquires the forms of letters by observation, by studying them in books, and by seeing them made on the blackboard by the teacher. He fixes these forms in mind by making them himself. Therefore, the teaching of form is one of the first essentials in teaching penmanship. The steps are (1) observation, (2) formation of mental images, (3) reproduction of the forms learned.

(b) FREEDOM. By freedom is meant the ease and skill which characterize one's writing. The acquisition of freedom constitutes by far the greater part of the work of learning to write, and a large portion of this lesson is devoted to exercises which will enable the teacher to assist her pupils in securing this much desired end.

(c) INTEREST. Interest is the appeal which the subject makes to a child. In nearly all cases the interest which the pupils take in their penmanship depends upon the skill with which the teacher plans the lesson and the zeal and enthussiasm with which she conducts the exercises. The teacher who plans her lessons wisely, and is enthusiastic, will have little or no difficulty in securing and retaining the interest in the writing lessons. All the principles and laws of interest which apply to other branches apply here with equal force.

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[1] B. D. Berry: *The Penmanship Trinity.*

(d) Applications. From the foregoing discussion it is clearly seen that the teacher should prepare her lessons in penmanship with as much care as she does those in other branches, and that the lessons should be systematically arranged and properly graded. The teacher should have a definite plan, and should proceed by the most logical steps to reach the end in view.

14. The Elements of Form. In learning to write, the child has to observe, memorize and make sixty-one characters—twenty-six small letters, twenty-six capital letters and nine figures. Were each of these characters formed on an entirely different plan from the others, the task, though somewhat formidable, would not be beyond accomplishment with a reasonable degree of effort. The problem, however, which confronts the child and the teacher is much more simple. These sixty-one characters are all formed from two simple elements—the straight line and the oval, by combining them in different ways. It naturally follows that children who acquire the power to make these elements with ease, skill and rapidity, become free, easy and legible writers. In all drill exercises the teacher should hold this idea in mind. The exercises given in the following pages are for the purpose of showing how the elements are modified and combined to form the different characters and how by their use the pupil may acquire skill in writing.

15. Position. Good position at the desk is essential to free and easy movement. Unfortunately, some school desks are so narrow that the preferred position cannot be taken. The front position is the most desirable, and whenever practical this should be assumed in all writing exercises. The pupil should sit erect, facing the desk, with both feet squarely on the floor. The body should be approximately erect, but may bend forward slightly, provided the bending is at the waist. Keep the spine straight. The pupil should not lean against the desk, nor against the back of the seat. Fig. 1

shows the position of the arms and paper. A is the right arm, B the left arm, P the paper, and D the desk. It will be noticed that the angle which the paper forms with the front of the desk is about one-third of a right angle; in other words, if the line which represents the lower edge of the paper were extended to the right edge of the desk, it would touch a point one-third the distance from the lower to the upper corner.

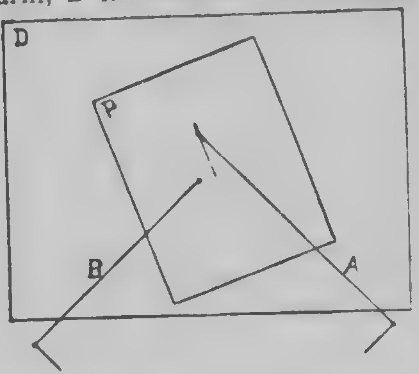


FIG. 1

The desk should be of such a height that when the writer sits erect, and lets his arm drop naturally at the side, the top of the desk will be a little higher than the elbow. For the adult, the writing should be from twelve to fourteen inches from the eye. When writing, both arms should be upon the desk, the right hand guiding the pen and the left holding the paper in position.

When school desks are too small to admit of the front position, the pupils may be permitted to assume a side position, in which the body is turned to the right, so that a line running from the right to the left side will form an angle of about 45° with the front of the desk.

16. Holding the Pen. The pen or pencil should be held loosely between the thumb and the first and second fingers, the thumb coming beside the first joint of the forefinger. The pen should point to the shoulder, as shown in Fig. 2. The ends of the last two fingers are the only part of the hand which should touch the paper, and these

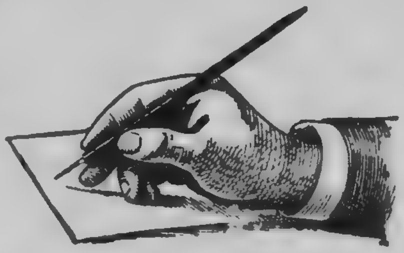


FIG. 2

finger-tips should glide lightly over the page. The first and second fingers should be nearly straight.

The forearm should rest upon the large cushion of muscle between the elbow and the wrist, and the hand should be in such a position that the under side of the wrist is nearly parallel with the surface of the desk, as shown in Fig. 3.

Caution. "Eternal vigilance" is the price of good results in writing. The necessity of insisting upon correct position and proper holding of the pen in every written exercise cannot be too strongly emphasized. Unless the pupils follow the directions given in Sections 15 and 16 until these positions become habitual, they will never make free and easy writers.

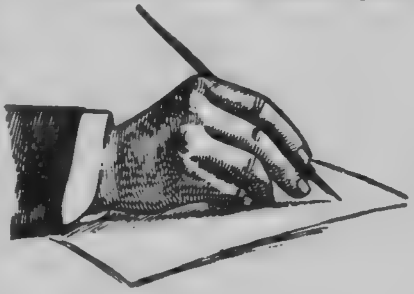


FIG. 3

17. Movement. Three movements are recognized in writing. These are the muscular, the arm or whole arm, and the finger movements. While all are used to a greater or less extent, the muscular movement is the only one which should be used for general writing. The finger movement is sometimes combined with this for forming the long stem and loop letters, but such a combination should not be freely resorted to. The arm movement is useful when very large writing is desired, but it is seldom called into use.

In the muscular movement, all forms except the long loops and stems, for which the fingers may be used, are made by the hand and arm, the fingers remaining in a fixed relative position. This movement is the one in general use by accountants, clerks and others who are engaged in constant writing with a pen. It is also the movement taught in business colleges and advocated by most systems of writing introduced into the public schools. It secures the best results with the least effort, and can be practiced longer than either of the other movements without fatigue. The finger movement, except for purposes already mentioned, should not be allowed. Train your pupils in the muscular movement, if you would secure the best results.

18. Preparation for the Lesson. When the writing period is reached on the daily program, all other work should be set aside, and the teacher should give her entire attention to the writing lesson. The work should be characterized by order, system and despatch. The desks should be cleared, the writing material should be quickly distributed, and the lesson should begin at once. If the pupils care for their own writing material, it should be placed on the desks promptly and quietly. If the material is to be distributed, monitors appointed for the purpose should attend to this duty without any attention on the part of the teacher. There should be enough monitors to distribute the material in about one minute.

19. Material. For drill exercises a good quality of unruled writing paper, 8½ x 11 inches, is the most suitable. The pen should have a smooth point and be of medium grade of fineness. Coarse pens, stubs and very fine pens are not suitable for these exercises, but the children in the intermediate and grammar grades may use a finer pen than those in the primary grades. The penholder should be reasonably large, and composed of cork or rubber. Metallic holders should be avoided, since they are more difficult to hold and cause fatigue in a short time. A good quality of black or blue-black ink should be used.

20. Methods. Before the carpenter can make close joints, he must learn how to use his tools with skill. Likewise, before the child can write easily and legibly he must learn how to use his pen. This fundamental principle is overlooked by those teachers who consider the chief purpose of the writing lesson to be the copying of forms from a writing book. While the writing book furnishes correct forms for study and excellent exercises for occasional practice, and therefore has its place, it should occupy only a limited portion of the time devoted to the writing lessons. It is impossible to secure the necessary freedom of movement by the use of the writing book. The moment the engraved copy is placed before the child, he becomes a slave to it, and position and movement are at once lost to view in his effort to reproduce the forms in the copy. A glance over any writing class which relies chiefly upon the book for practice reveals the futility of attempting to teach writing in this way.

The teacher must therefore conduct many drills which have for their purpose the formation of right habits of position and movement. While freedom is an end sought, it must be remembered that freedom does not mean "license to do as you please," but orderly, well-directed movement. All exercises should have a definite purpose, and the pupil should have this purpose clearly in mind. The old adage, "Practice makes perfect," must here be modified to "Only right practice makes perfect in penmanship."

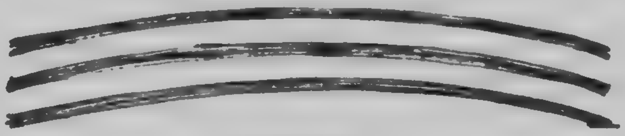
At the beginning of each writing lesson, call attention to position, and see that each pupil assumes the correct position before the practice begins. As the exercise progresses, move quietly among the pupils, correcting faulty positions and wrong movement. It is only by persistent individual work of this sort that satisfactory results can be obtained. Praise effort; encourage those who become despondent; try to see something to commend in the work of each pupil, but criticise defects and keep a high standard of excellence before the class.

21. Preliminary Exercises. The first exercises should be designed to make the pupils feel at ease in the writing class, and to impress upon them the importance of correct position and movement. In these exercises no attempt should be made to form characters.

(1) When the class is in position, with pens in hand, have them move the right hand from left to right and back several times, using as a pivot the cushion of muscle upon which the forearm rests. There should be little or no motion at the wrist joint, and in no case should the wrist joint form

the pivot upon which the hand moves. The hand should glide over the paper on the tips of the third and fourth fingers, as in regular writing.

At first let the movement be made without marking upon the paper. Uniformity of movement is secured by counting. When the class is in position, say, "Ready. Right, left; right, left; right, left; one, two; one, two;" and so on. Continue the counting for about a minute, then pause for a brief rest. Be sure that the hand is held so that the penholder points to the shoulder. After two or three exercises like this, let the pupils mark upon the paper for a few exercises. The result should be similar to that represented in Exercise 1.

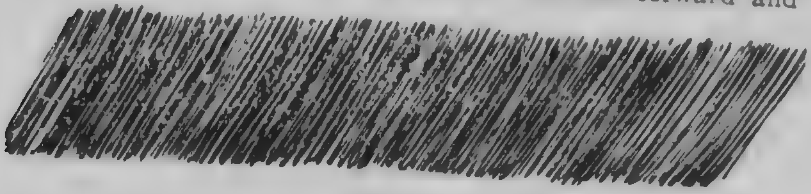


EXERCISE 1

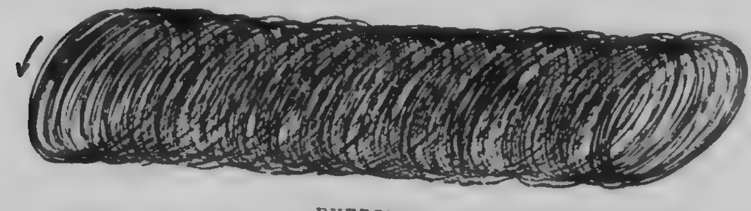
For the first few exercises it may be well to say nothing about the length of the lines, but as soon as the pupils become accustomed to the movement, the length should be restricted so that it will not exceed four inches, and better results are secured with a length of about three inches. Three or four minutes can be spent profitably in such drill at the beginning of each writing lesson.

(2) The next drill gives practice on the straight line. The movement is made by allowing the hand to play forward and backward on the paper, while the forearm rests upon the desk, as in Fig 1. The slant will depend upon the way the pen is held, and probably it will not be exactly alike in any two cases. This, however, need not cause any concern. Regulate the movement by counting, as in the first exercise. Begin without marking, and then use the ink. This exercise is more difficult than the first, and there will probably be more irregularity in the work of the pupils. The result sought is seen in Exercise 2.

(3) The third exercise is on the second element of form—the oval. The forward and backward motions are the same as in Exercise 2; but while the hand moves forward and backward, it also moves from right to left, so as to form the oval. Regulate the movement by counting "one" on each down stroke. This exercise should be resorted to again and again, until the pupils can reproduce Exercise 3 with ease and rapidity.



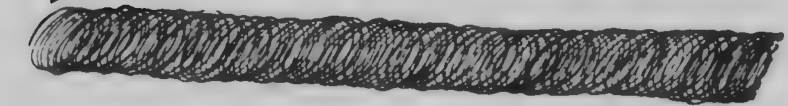
EXERCISE 2



EXERCISE 3

Exercises 2 and 3 should be practiced until they can be written in smaller size, as illustrated in Exercises 4 and 5.

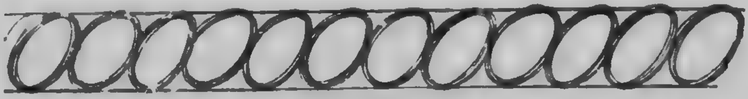
EXERCISE 4



EXERCISE 5

Sixth, seventh and eighth grade children should be able to do this with but little preliminary drill.

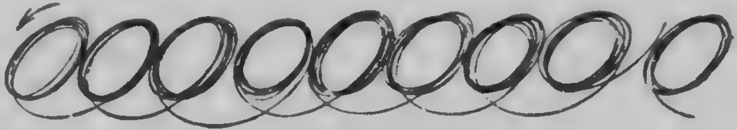
(4) The next exercise shows the separate oval, which is the best form for all characters or parts of characters containing curves (Exercise 6). The movement in this drill should be regulated by counting, as in the continuous oval. The drill should be practiced at nearly every writing lesson in the fourth and fifth grades.



EXERCISE 6

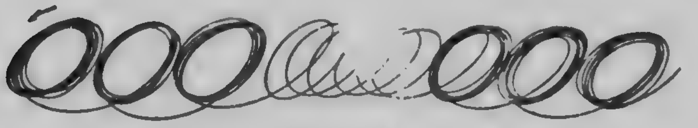
22. Development of Forms. Variety in exercises and plans is necessary to maintain interest. (1) After the pupils have produced the continuous oval in the ordinary way, with the down stroke on the left, let them practice with the movement reversed. This drill should be repeated until the children become as proficient in making the continuous oval with the reverse movement as they are in producing it by the movement shown in Exercises 3 and 5.

(2) Exercise 7 is produced by the same movement as Exercise 6. Joining the ovals by a swing to the right is designed to give greater freedom in movement. Count on each down stroke. When an oval is completed, pass to the next on the word *and*; as, "Ready. One, two, three, four, five; and one, etc.," until the line is completed. This is an excellent drill and should be often repeated. From Exercises 6 and 7 the pupils get the idea of the formation of O.



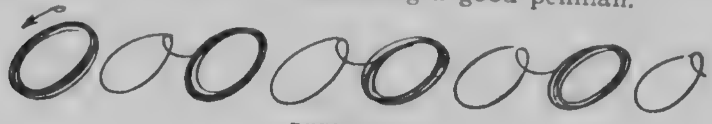
EXERCISE 7

(3) In Exercise 8 an additional step is given, in the formation of the single line ovals in the center of the figure. Observe the directions given in Exercise 3, Section 21.



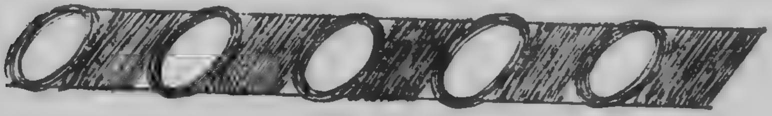
EXERCISE 8

(4) In Exercise 9 the O alternates with the oval. This exercise shows the pupil's power of control over his movements. If the O's are even and light, he has gained such control as will insure his becoming a good penman.



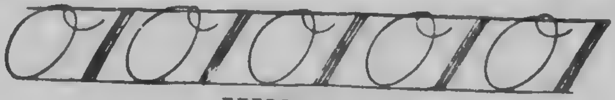
EXERCISE 9

(5) In Exercise 10 we have a combination of the elements of form. This exercise should be preceded by drills on Exercises 4 and 6, in Section 21. It is more difficult than those which have preceded it. The tendency will be to make the straight lines longer than the long diameter of the ovals. Count on the down strokes. When the class can reproduce this exercise as given, it shows excellent progress.



EXERCISE 10

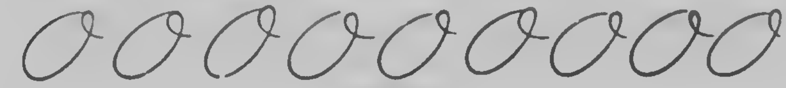
(6) In Exercise 11 the straight lines and ovals are separated, the latter appearing as O's. Count "one" for each O and "one" on each down stroke in the straight lines; as,



EXERCISE 11

"one, and one, two, three; one, and one, two, three," etc. Light lines and even strokes in all characters should be the aim in this drill.

(7) In Exercise 12 the O's are given alone. All steps in the development of this letter are now completed, and the O stands by itself. Count "one" for each O.



EXERCISE 12

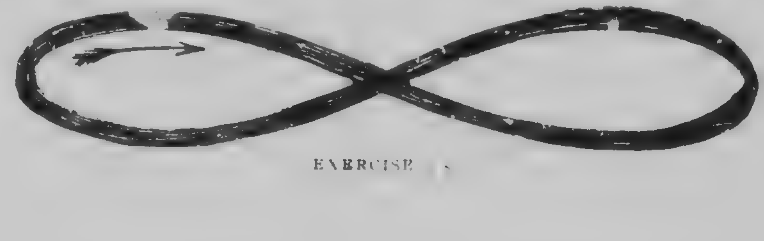
(8) In Exercise 13 we return to the movement with which we began, except that the hand now moves in a straight line instead of over the arc of a circle. Practice the first exercise in Section 21, then change to this:

EXERCISE 13

The pupils will discover that the straight line is more difficult to make, and that there must be no motion at the wrist. After practicing a few minutes on Exercise 13, change to 14. These drills are valuable in training pupils to write in straight lines on unruled paper.

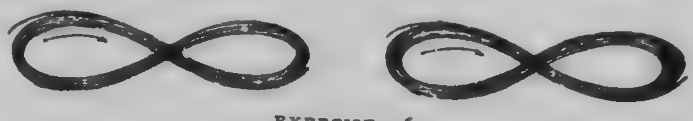
EXERCISE 14

(9) In Exercises 15 and 16 the right and left and oval movements are combined. Produce these forms first by moving the hand as indicated by the arrows, then reverse the movement for an equal number of figures. Exercise 15



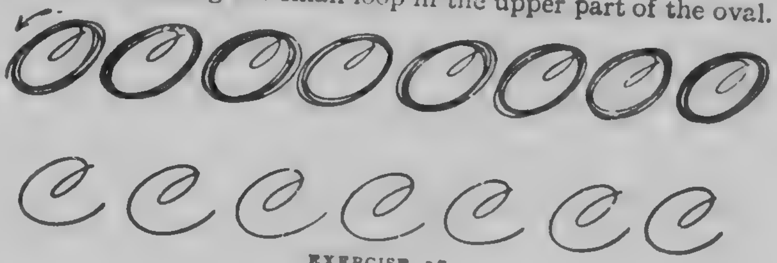
EXERCISE [illegible]

affords good opportunity for practicing the whole arm movement, if this is desired for variety. This is the most difficult exercise yet given, and its mastery marks a good degree of progress in gaining control of the muscles. Exercise 16 reduces the same exercise to one employing muscular movement only.



EXERCISE 16

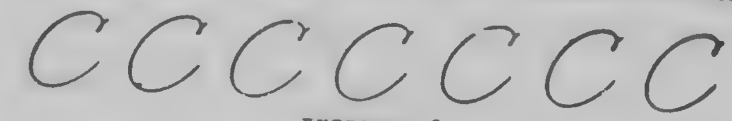
(10) Exercise 17 shows the evolution of C from the oval. Begin by forming the small loop in the upper part of the oval.



EXERCISE 17

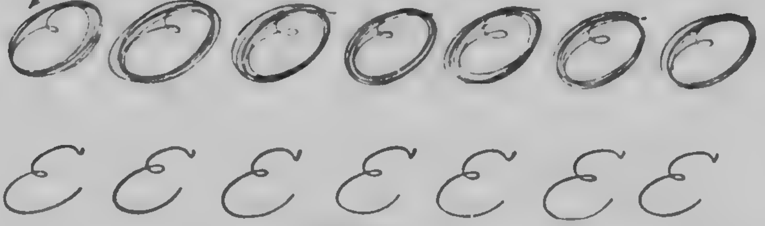
Count as in the formation of other ovals. In the lower line the oval is dropped and the C's stands out alone.

Exercise 18 shows a simpler form of C, but one more difficult to make, because of the small loop at the beginning. The drills on ovals should enable the pupils to make C's of even size and light lines. Practice until this result is reached.



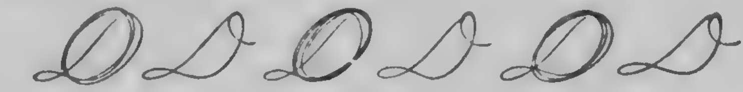
EXERCISE 18

(11) Exercise 19 shows the evolution of E from the oval. Make the oval, then the E within it. Count as in other exercises. In the lower line we have the E standing alone. Many lines of E's should be made.



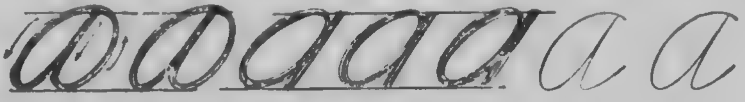
EXERCISE 19

(12) D starts with a downline line slightly curved forming the left side of the letter, and ending in a small loop at the bottom. The oval is then made around this, to give an idea of the general form of the letter. Alternate ovals and D's are shown in Exercises 20; practice faithfully until the pupils can form the letter readily.



EXERCISE 20

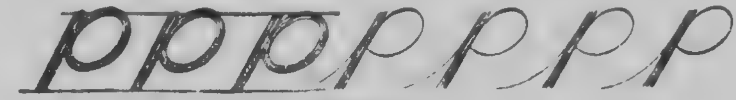
(13) A is a combination of the oval and the straight line. Exercise 21 begins with the downward stroke indicated by the arrow in the center of the first character. Carry the pen



EXERCISE 21

around, forming the outside of the large oval. Let the pen turn upward to form the right side of the left oval, then bring it down on the first line formed. Practice on these figures until the pupils have acquired the movement. The transition to the A is then simple and easy.

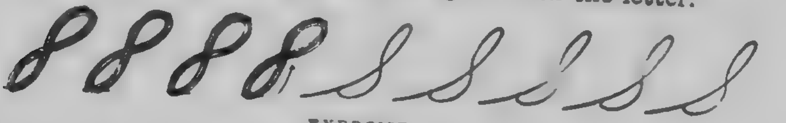
(14) In the formation of P the full straight line and the



EXERCISE 22

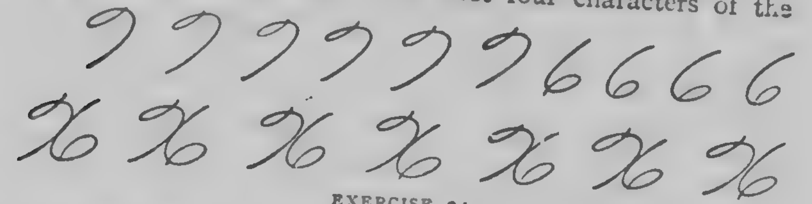
small oval are combined. Practice the straight line first, then join the oval to it. The transition to the letter is evident.

(15) S is formed by the movement which produces Exercise 16 turned in a nearly vertical position. It is a good plan to alternate this drill on the figure with the letter.



EXERCISE 23

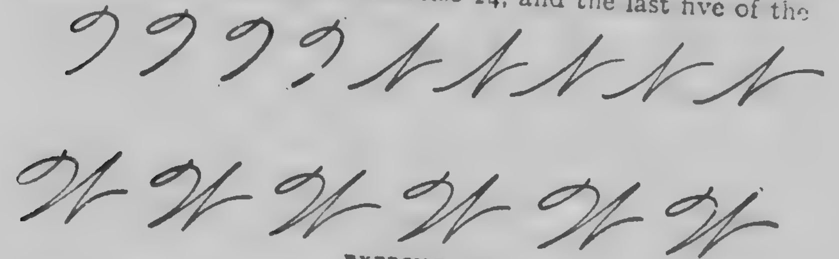
(16) Exercise 24 gives the elements used in forming parts of several capital letters. The first four characters of the first line form the first part of M, N, W and X; the last six form the last part of X and the figure 6.



EXERCISE 24

The last line of the figure shows the elements combined to form X.

(17) In Exercise 25 we have the elements which unite to form W. The first four characters of the first line are the same as the first four in Exercise 24, and the last five of the first line resemble *t* when it is written as the last letter of a word. This should first be formed separately and then



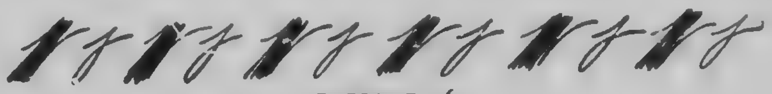
EXERCISE 25

united to form W, as shown in the last line of the figure. This capital is usually faulty because pupils do not have a clear idea of its correct form. The drill here given is calculated to fix the form in their minds.

23. Small Letters. No new principles are involved in forming the small letters. The movements already described are used here only on a smaller scale. When loop or stem letters occur in the middle of a word, the fingers are often employed to form the loop or stem, while the regular muscular movement is used in making the other letters. Since the small letters constitute the great body of writing, they require a porportionate amount of practice. One's penmanship is characterized by his small letters. If these are light, even and well formed, one is said to be a good writer. A pupil's writing is poor just to the extent that his small letters fail to reach the standard here given.

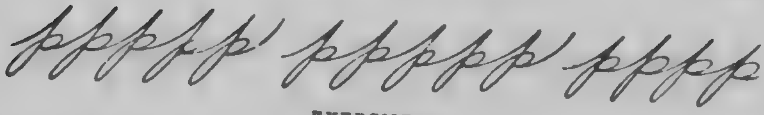
The teacher should illustrate the evolution of the small letters, and lead the class to see clearly how the drill exercises are related to their formation. Always keep the simplicity of the problem in mind. When the pupils have learned the foundation movements well, they have practically learned to write.

(1) Exercise 26 again introduces us to the straight line drill, and shows how *j* is developed by this exercise. Have the pupils make several lines of these figures, then change to the letter, and write a page or more of *j*'s. Continuous practice on one character is necessary until the class has acquired the ability to make it easily and in good form; in this way every lesson is a step forward.



EXERCISE 26

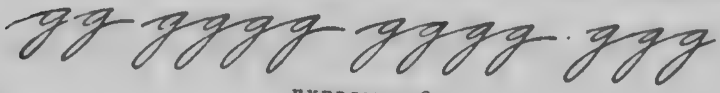
(2) Small *p* combines the stem and loop. It is well to use the straight line drill with this exercise also. Exercise 27 shows a good style of letter and one easily made. This



EXERCISE 27

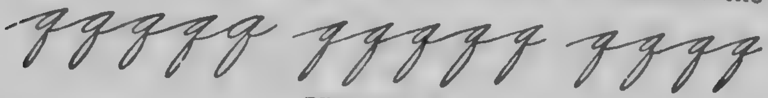
is a somewhat more difficult exercise than the preceding, and it will require considerable practice.

(3) Small *g* combines the oval and the loop below the line. The loop is most easily made by the finger movement. Exercise 28 furnishes a good copy for this exercise.



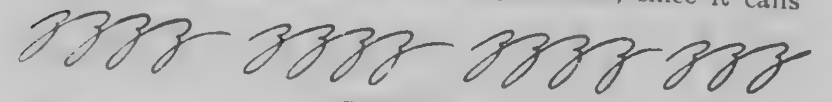
EXERCISE 28

(4) The change from *g* to *q* is very simple, as shown in Exercise 29. The loop is made by carrying the hand to the right of the downward stroke, and joining the line thus formed to the first line just below the oval. This movement is not used as frequently as that employed in making the *g*, and the exercises will require frequent practice.



EXERCISE 29

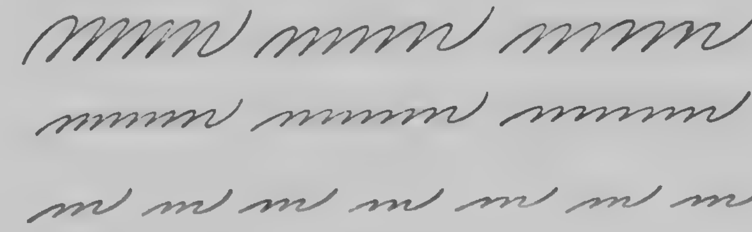
(5) Exercise 30 illustrates the formation of *z*. The part of the letter above the line will require care, since it calls for a movement not often made. It will also be noticed that the down stroke in the loop bends to the right more than in the *g*.



EXERCISE 30

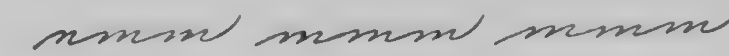
(6) Exercise 31 is a drill exercise which should be used as a preparation for *m* and *n*. This exercise is evolved from the reverse oval by making a narrow curve with the upward stroke and a straight line with the downward. This drill

should be practiced until the movement produces small, even lines, as shown in the second line. From this the transition to single letters (as shown in the last line of the figure) is very easy.



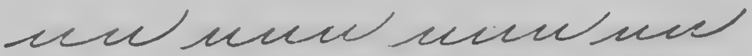
EXERCISE 31

Combination of *m* and *n* and grouping of m's should follow.



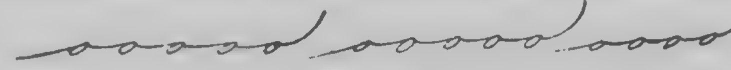
EXERCISE 32

(7) Small *u* is formed with the same movement as *m* and *n*, except that the curve is at the bottom. Exercise 33 gives a good exercise for practice. It should be noticed that *i* is one-half of the *u*, with the dot above.



EXERCISE 33

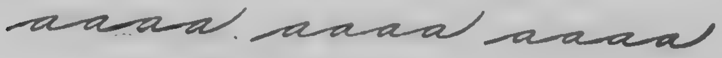
(8) In *o* we return to the complete oval. Make the characters small and even, and join them as shown in Exercise 34. The o's should cross the page in straight lines. If pupils find it difficult to do this, return to Exercise 12, Section 22.



EXERCISE 34

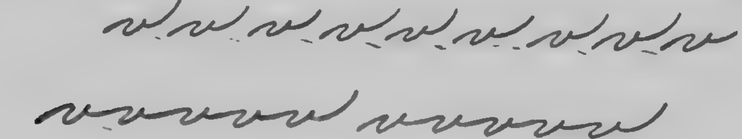
(9) Small *a* has the same form as the *a* practiced in Exercise, 21 Section 22. When pupils have gained control of their muscles, they should find no difficulty in reproducing

the copies as shown in Exercise 35. The directions given for small *o* apply here, as well.



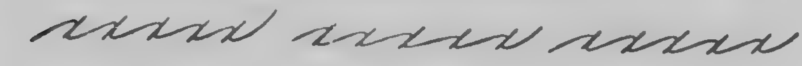
EXERCISE 35

(10) In making *v*, Exercise 36, notice that the first part is the first part of *n*, and that the upward stroke forms a part of the oval, but the hand is carried to the right, leaving the oval open at the top, and the letter is finished with a small loop and an upward movement of the hand. Connected letters, shown in the lower line of the figure, should constitute an exercise following that of the separate letters in the upper line.



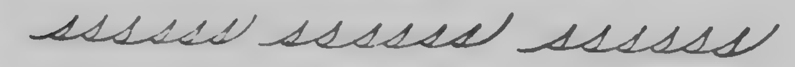
EXERCISE 36

(11) From a study of Exercise 37 it will be seen that *x* consists of the first part of *n* and a straight line. Make the curves first, then cross with a straight line.



EXERCISE 37

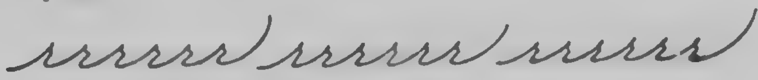
(12) In small *s* we have a letter slightly higher than *a*, *o* and *n*. A common fault in making this letter is failure to close it at the bottom. The s should receive careful attention in the drill exercises.



EXERCISE 38

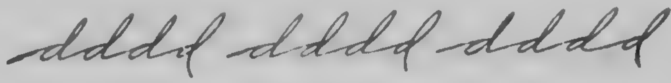
(13) Small *r* (Exercise 39) is the same height as *s*, but it is more difficult to make. The formation of the upper part of the letter requires care. This letter is often so faulty

that it is illegible; therefore, it should receive a good deal of practice.



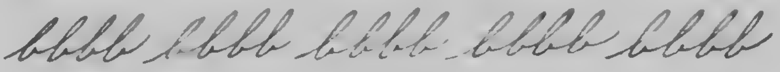
EXERCISE 39

(14) Small *d* (Exercise 40) consists of a small *a* joined to the stem, which, as in the illustration, is often written in the form of a loop.



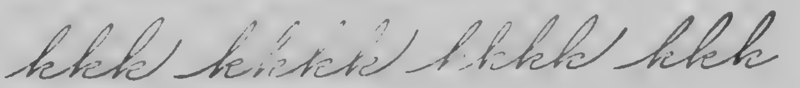
EXERCISE 40

(15) Small *b*, Exercise 41, consists of a loop with the right-hand part of the *v*. The tendency in making this letter is to give too much slant to the stroke forming the lower part. Considerable practice is necessary to overcome this tendency.



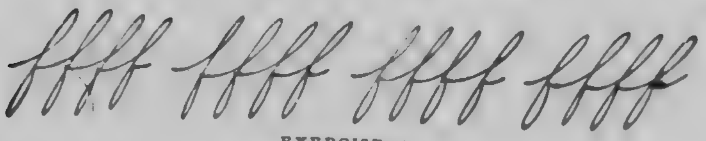
EXERCISE 41

(16) Small *k* (Exercise 42) consists of the loop and a character resembling a small capital *r*. The lower part of the letter requires careful attention.



EXERCISE 42

(17) Small *f* is the longest of the small letters. It consists of the common loop above the line and the *q* loop below. The line forming the left side of the loops should be nearly straight. The tendency is to give this line too great a curve.



EXERCISE 42

(18) The exercises for practice on page 230 will be found helpful and will lend interest to the work in the upper grades.

24. Relation to Other Subjects. Penmanship is closely related to all branches in the course of study into which written exercises enter. It frequently happens that in their written exercises in other branches the pupils violate all the principles which they have been taught in the writing lessons. So long as this state of affairs is allowed, good results in penmanship are impossible; therefore, through the intermediate grades, at least, every written exercise should be an exercise in penmanship, to the extent that correct position and movement are maintained. Written exercises in the fourth and fifth grades should be short, so that the pupils can have ample time to write them. Undue haste and lack of supervision in these exercises is one of the most prolific causes of poor writing found in the public schools.

25. General Suggestions. The following suggestions will be found helpful in planning and supervising the work in penmanship.

(1) Study is as essential as practice. Study yourself and lead your pupils to study the forms of the letters and the movements necessary to write them. You cannot reach high ideals by haphazard work.

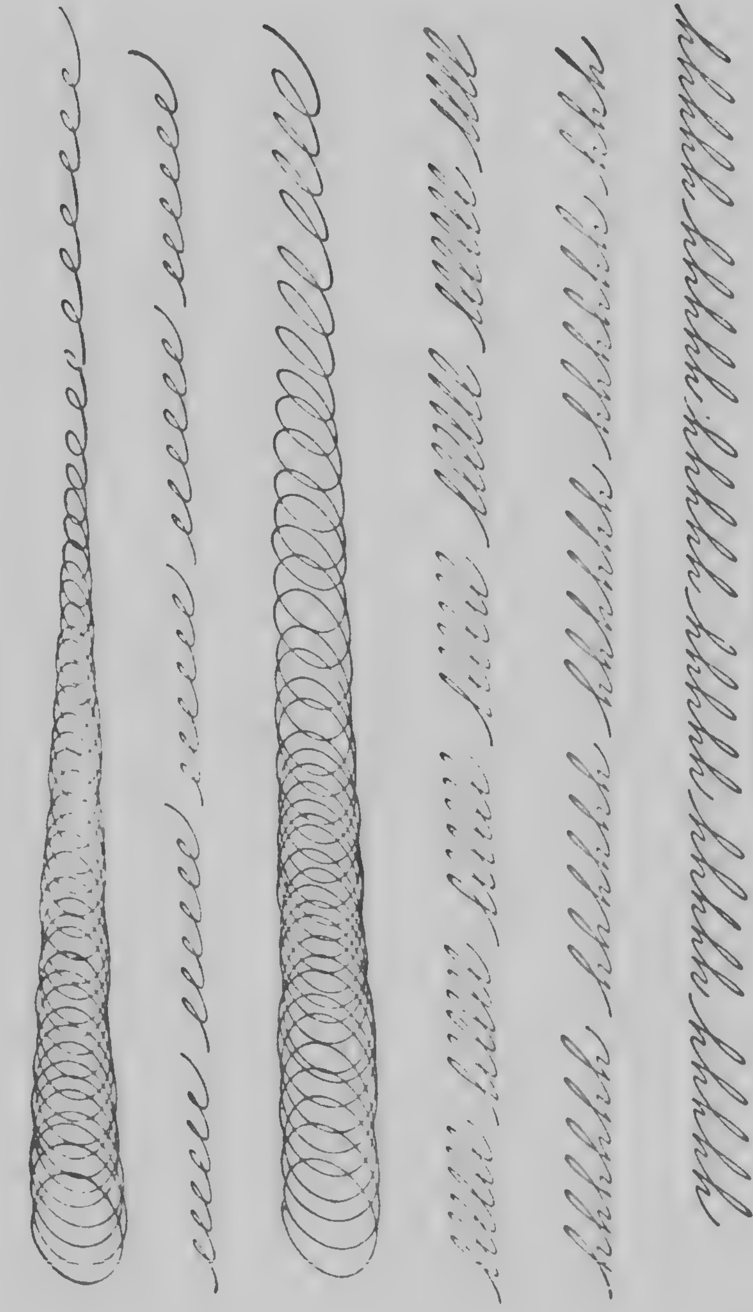
(2) It is easier to form right habits than to break off wrong ones. See that each exercise in writing helps to fix proper habits of position and movement.

(3) Give attention to the little things. See that the writing material is kept in good order, and that it is so arranged that it can be distributed quickly. Make such changes of seats as will most nearly adjust the height of the desk to the pupils. Have the work for each lesson ready before the writing period arrives. Give such other attention

MICROCOPY RESOLUTION TEST CHART

[illegible]

[illegible]



EXERCISE FOR PRACTICE

to details as may be necessary to make the work move along in a pleasing manner.

(4) Do not be discouraged nor allow your pupils to become discouraged over the results of the first few lessons. If the pupils have never used the muscular movement, they will not write as well by this movement at first and will want to continue in the old way. Impress upon them the importance of learning how to use the pen. When this is learned, all letters are easily made.

(5) Intersperse drill and regular writing in nearly all the writing lessons. This gives variety and enables the pupils to feel that they are learning to write.

TEST QUESTIONS

1. To what extent are rules for spelling valuable? Show why the application of these rules is limited.
2. Do you favor the use of the spelling book? What advantages do you see in its use? What disadvantages?
3. What instruction for studying their lessons from a spelling book would you give pupils of a fourth grade?
4. Explain your method of correcting errors in your spelling classes. In what respects do you find it defective? How can these defects be remedied?
5. Show how a study of derivation in the grammar grades assists pupils in learning to spell.
6. Show the importance of having children form good writing habits before they complete the fifth grade.
7. Why is attention to slant of little importance? How is form learned?
8. Give an outline of the preparation which you make for your penmanship lessons.
9. What are your greatest difficulties in teaching penmanship? How do you overcome them?
10. Why is penmanship so often neglected in schools? What are the most prolific causes of poor writing?

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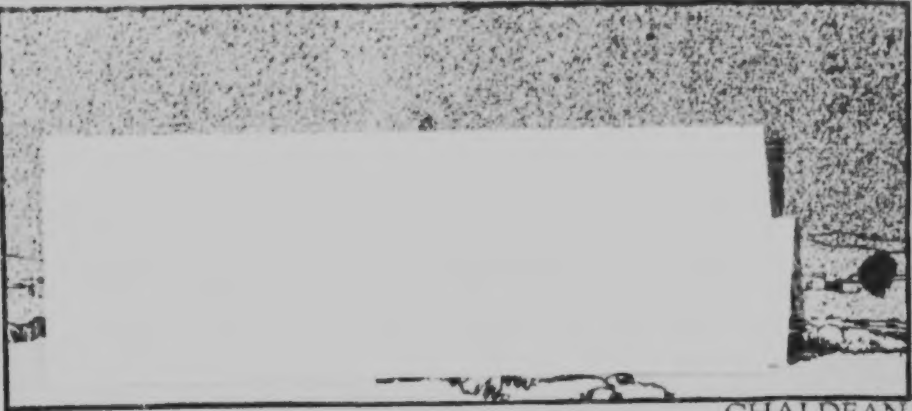

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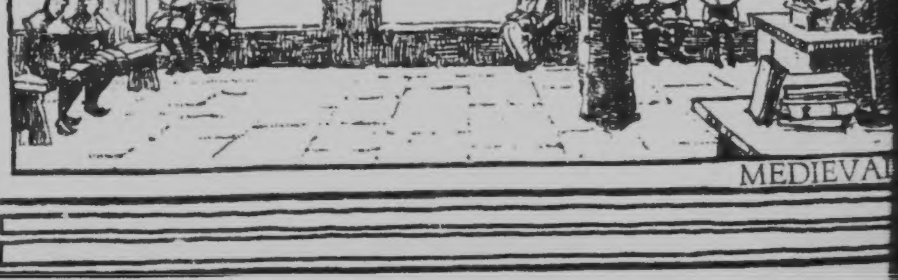

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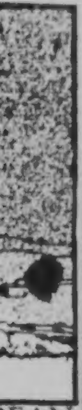

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